NATIONAL MUSEUM OF VICTORIA

THE JOURNAL of The Department OF AGRICULTURE

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Vol. XXXVII.—Part 8. AUGUST, 1939. PRICE, 3D.

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Issued by direction of the Hon. E. J. Hogan, M.L.A., Minister of Agriculture.

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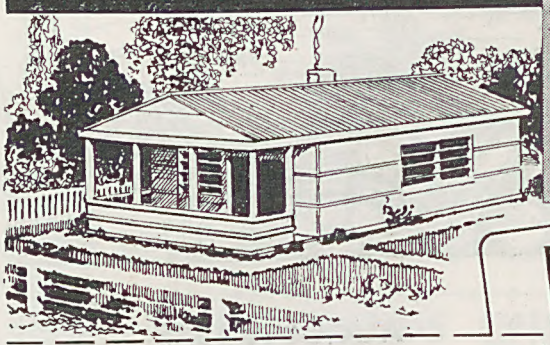

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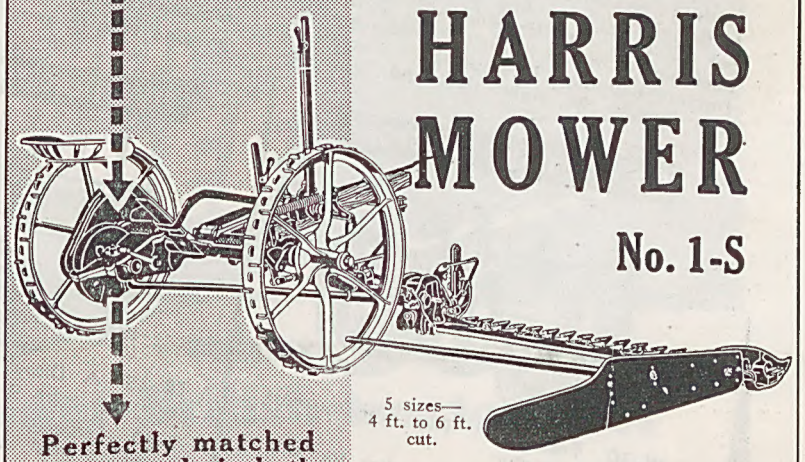

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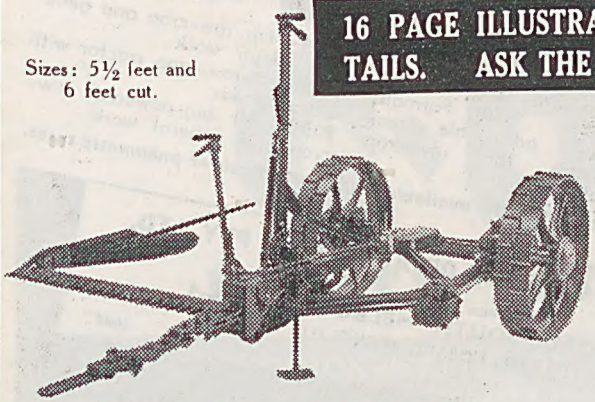

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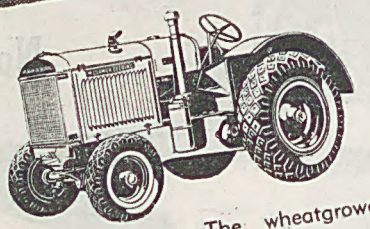

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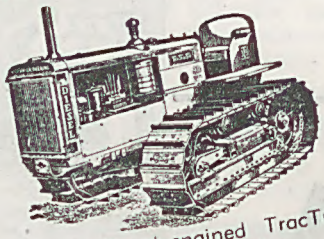

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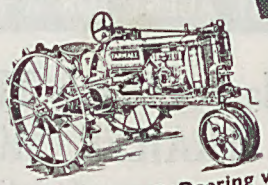

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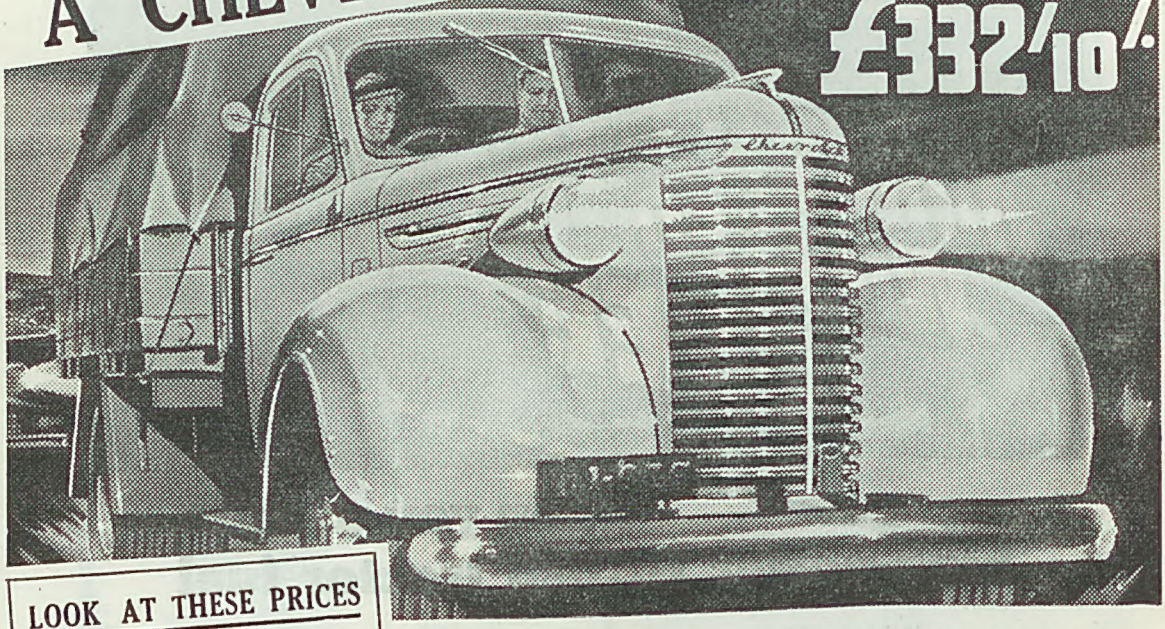

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Journal of Agriculture, Victoria—August, 1939.

Utilization of Irrigated Pastures

By E. T. Beruldsen B.Sc. (Agric.), Senior Irrigation Officer

THE factors governing the successful establishment and maintenance of production from irrigated pastures may be summarized as careful preparation of the land in the first instance, the sowing of the best strains of the most suitable species, regular irrigation, adequate manuring, and finally efficient utilization. Once the pastures have been established most farmers appreciate the benefits of adequate watering and manuring whether or not they adopt good methods in these respects, but few have a proper appreciation of the vast influence the grazing animal can exert on the productivity of the pastures. Consequently, we find tremendous variation in the grazing methods adopted by different farmers, and many of these methods violate all the fundamental laws of nature in regard to the possible survival of the pasture plants and their natural productivity.

Much pasture research has been directed to this very important aspect of management, and in recent years at the Research Farm, Werribee, experiments have been carried out which have been most illuminating in regard to various complex factors in grazing management. These experiments even have included studies of the grazing idiosyncrasies of various types of domestic animals; horses, cattle, and sheep, in an endeavour to understand better the most common machinery used to harvest pasture plants.

Showing the contrast when irrigated pastures are grazed by horses (left) and sheep (right). Note the irregular patches in the horse paddock.

Briefly, by regularly charting areas of pasture exclusively grazed by these different classes of farm animals much useful information was obtained. Horses would waste up to 50 per cent. of the pasture, concentrating their attention on short growth, and the large rank areas which evolved were rendered still further unpalatable by the exclusive concentration of the droppings in these patches. Such areas retained definite contours over a period of years and even after a prolonged period of drastic grazing with cattle and sheep, obliterating these contours, the pasture reverted to its previous appearance as soon as exclusive grazing with horses was recommenced. There was no question of the rank patches of to-day becoming the short patches of to-morrow.

Cattle were found to be the least fastidious of the grazing animals, but mainly through fouling, a large proportion of waste would occur even when the numbers carried were concentrated sufficiently to graze the paddock uniformly. In the case of milking cows, attempts to force the animals to eat off the pasture beyond a certain stage would result in the sudden lowering of milk production.

Probably sheep are the most efficient grazing animals. When concentrated on relatively small areas of pasture they will act almost like a mowing machine, and successive grazings by sheep soon give the pasture a uniform appearance. Like cows, sheep scatter droppings indiscriminately over the pasture so that no part is fouled more than another. In the case of cows, however, the droppings often prevent pasture growth on small areas for considerable periods, while with sheep the relatively small droppings do not blanket the pasture, but dry rapidly, and the fouling is of a very temporary nature. At the same time, sheep can do more permanent injury to a pasture than any other type of stock in that they will graze the pasture plants too closely and some too frequently, before there is any indication from the condition of the sheep that they are suffering from a shortage of feed.

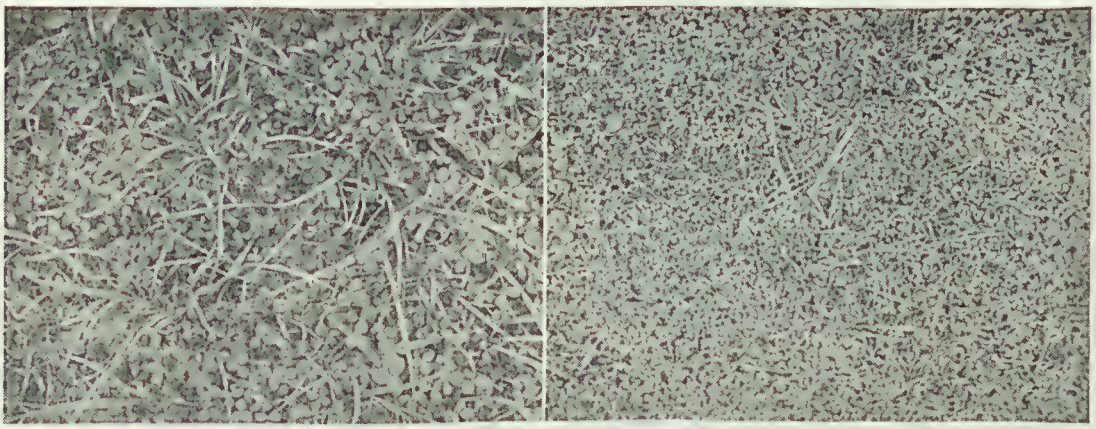
Some pasture plants are more susceptible than others to very frequent or too severe defoliation. For example lucerne or cocksfoot will soon thin out or even disappear if treated too harshly in this manner. All pasture plants do suffer severely in their productive capacity if cut or grazed too often. The leaves of the plants elaborate all the food materials necessary for their growth, and since the action of light is absolutely necessary for these processes to go on, any unduly severe restriction of the available leaf surface will correspondingly restrict the absorption of light. Again, the plants breathe through the leaves, and require a certain leaf surface for the transpiration of moisture, another most important process associated with growth. Any food material which is not required immediately by the plants is stored up in their root system for emergencies such as occur when the plants are defoliated. Thus, one can see how the natural development and productivity of pasture plants will be inhibited by too frequent and too severe grazing.

On the other hand if pasture plants are protected for too long periods they become fibrous and tough, and what may be gained in production may be lost in quality. Further, tall-growing grass species may tend to smother and suppress the shorter clovers.

Accordingly, a very nice balance must be struck at some point in the growth of pasture plants when productivity will be reasonably high and quality, as represented by the chemical and botanical composition, will be ideal for the stock. It has been estabished beyond doubt, that this nice balance between productivity and quality is attained when irrigated pastures are permitted rest periods of one month between grazings.

At each grazing the pasture should not be grazed almost to ground level. This is particularly important in the northern irrigation areas where such a practice results in large losses of moisture through direct evaporation from the surface soil. This would apply to even a greater extent in the case of heavy soils which tend to crack badly on drying out. If sufficient cover is retained in the pasture after grazing, this loss of moisture will be minimized and a greater proportion of the applied moisture will be available for the useful process of transpiration through the plant. Also the retention of sufficient cover reduces the number of opportunities for establishment of weeds and inferior fodder plants.

If the farmer takes due cognizance of these fundamental facts, he will benefit not only from the increased productivity of his pastures, but also from the improvement in health of his stock. Fodder from pasture which is spelled for one month between grazings is a well-balanced ration for stock. During the lambing season of 1938 severe mortality from twin-lamb disease was experienced among ewes grazing on a short rotation period at the Research Farm at Werribee, while very little



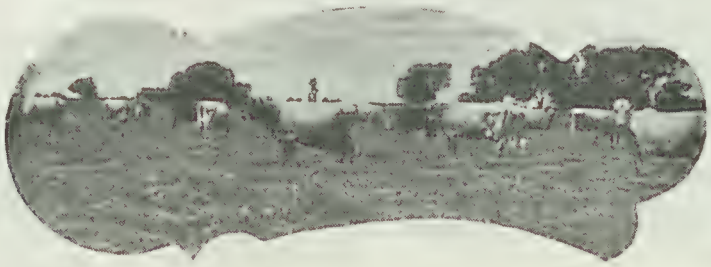
Grazing management has an important influence on the composition of a pasture. Illustrated above are two equal areas which have been subjected to different cutting (motor lawn mower) treatments. Left, once every five weeks; right, once a week.

or no incidence of the disease occurred among some of the same line of ewes which were grazing on longer rotation periods.

It has been noted that the incidence of "bloat" in dairy cattle is much higher on farms where a short rotation period is adopted. Many dairy farmers raise objections to the longer rotation period for what they call practical reasons. Some affirm that they have not enough paddocks, and on investigating one finds that they may have at least half a dozen paddocks which should suffice to carry out this system. However, it is found that the number of paddocks available for the day grazing has been reduced in that one or two are always reserved for night paddocks, while one has to be kept for dry stock. Very often the virtues of the night paddocks are extolled because they carry so many stock every night of the year, and yet appear to be in wonderful condition. The reason is not hard to find, since under this system the night paddocks are little more than bedrooms, and closer observation would show that the stock do little more than pick at the feed since it is so unpalatable through continual fouling. Every paddock irrespective of its convenient proximity to the cow shed should be regularly spelled.

The dry stock should be used as "followers." Sometimes it is affirmed that the dry stock have been used as followers and that they have failed to clean up the small areas of rank growth left by the milkers but have punished further the areas already grazed. Dry stock will do this if the paddock is not spelled for a few days after the exit of the milkers. A few days spell before introducing the followers will help to render the leavings fresher and consequently more palatable.

The combination of cattle and sheep grazing, with care taken not to over-stock and consequently over-graze, has been attended with great success in New Zealand and in isolated instances in Victoria. On certain dairy farms, a small flock of breeding ewes is used to follow up the dairy cattle, and this system besides improving the uniformity of the pastures, and the suppression of certain weeds, has the added advantage of following the maxim "not to have all your eggs in the one basket."



New Pig Market

Opened by the Minister of Agriculture

ON Wednesday, 19th July, the Minister of Agriculture, The Hon. E. J. Hogan, officially opened the new pig and calf market established by the Western Metropolitan Market Trust at North Brooklyn.

Mr. Hogan referred to the fact that it was only seven months since he had introduced into Parliament a Bill constituting the Western Metropolitan Market Trust and empowering that body to establish and carry on a market for the sale of pigs and calves. In the past, buyers and sellers of pigs and calves had had to contend with many inconveniences. The old Melbourne Pig Market had been an undesirable feature of a great city but now a modern hospital was to be erected on that site. When the old Pig Market site had been required for a new hospital the Government had inspected several sites suggested for a new market, this site at Brooklyn eventually being selected by a Sub-Committee of Cabinet and approved by the Public Health Commission.

The new market had many advantages over the old pig market at Parkville. Railway facilities were infinitely better and no longer would pigs and calves have to be driven through the city streets. Pigs and calves would be delivered direct from the railway trucks to this new market, where excellent facilities were provided for loading and unloading pigs and calves from both road and rail transport. He was confident, Mr. Hogan continued, that this market was a great improvement on any market in the State. It was served by excellent roads and was close to a number of bacon factories and freezing works. There was plenty of room for future expansion and as the pig industry continued to develop it might be that this new market would be insufficient and extensions would be necessary.

Mr. Hogan explained that the total cost of the work so far had been approximately £42,000 made up of—

Buildings and market	£27,000
Railway siding	4,180
Metropolitan Board for main ..	1,261
Road approaches (approximate)	6,000
Levelling, &c. around market ..	1,200
Land (approximate)	2,000

After providing these splendid facilities for the marketing of pigs and calves, the Minister added, the Trust deserved the full support of every producer and every member of the trade. The Trust did not intend to make profits; the market dues charged must be approved by the Government. The charges would be moderate and would depend on the extent this new market is patronized by producers.

Mr. Hogan congratulated the Trust on the successful completion of the first part of their job and the Municipalities of Footscray, Essendon, Williamstown, Braybrook and Werribee on the mitigation of the annoyance to which they had been subjected in the past. He hoped the market would be a great success.

Wireless Talks for Farmers

WITH the co-operation of the Australian Broadcasting Commission, the Victorian Department of Agriculture is conducting a series of wireless talks on subjects of particular interest to the man on the land. These talks are being broadcast from the regional stations, 2CO (Corowa), 3GI (Gippsland), and 3WV (Horsham) on Friday evenings, the 20-minute sessions commencing at 7.40 p.m.

The next talks will be on 18th August and 1st September.

Listeners desiring any information connected with the management of their farm should send a letter to Mr. J. Keane, B.Agr.Sc., Department of Agriculture, Melbourne, and a reply will be given over the air. If you do not desire your name broadcast use initials or a nom-de-plume, but do not omit to mention your district.

Infectious Pneumonia of Swine

Its Prevention and Control

By C. Pope, B.V.Sc., Veterinary Officer.

INFECTIOUS Pneumonia of swine, or as it is more commonly termed Swine Plague, is a common and rather widespread disease in Victorian pigs, and owing to its insidious nature it represents a constant and steady loss of revenue to the pig industry of the State. The name Swine Plague was originally introduced from Europe, where it is used to designate a condition in pigs similar to, but not the same as, that seen in Victoria. Here, the name Infectious Pneumonia is more applicable as it is scientifically correct and it is descriptive of the disease.

In Victoria it has been proclaimed under the Stock Diseases Act, and it is therefore incumbent upon every pig owner, who suspects the existence of infectious pneumonia amongst his pigs, to report his suspicions to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2, or to the Stock Inspector for his district. Advice will then be given with regard to the necessary steps for the control and eradication of the disease on the property and the procedure which should be adopted to prevent the spread of the disease to other properties. Under the name swine plague infectious pneumonia has also been proclaimed under the Swine Compensation Act which offsets much of the hardship to which an owner might be put in ridding his piggery of the disease.

In nature, the disease is essentially a pneumonia of an infectious type, though the very acute form may also be classed as a septicaemia. It is caused by an organism or germ which belongs to the group known as the Pasteurellae. This germ may be carried by pigs which in good, clean, hygienic quarters will show little or no evidence of being infected, but it becomes activated and assumes an increased virulence as the result of the lowering of the pigs vitality and resistance. Exposure, irregular and bad feeding, faulty sanitation and hygiene, transportation, &c., are some of the factors that will reduce the resistance of a pig and so allow the germ to set up the disease. With its added degree of virulence, the germ starts a focus of a disease which is highly infectious and which will soon spread through the piggery, causing serious trouble and loss. It will thus be seen that, through faulty management, the disease may arise on an apparently hitherto disease-free property and further, once it has assumed its virulent form the disease becomes highly infectious. It will also be seen that the prevention of the occurrence of the disease on a property can be attained by good piggery management.

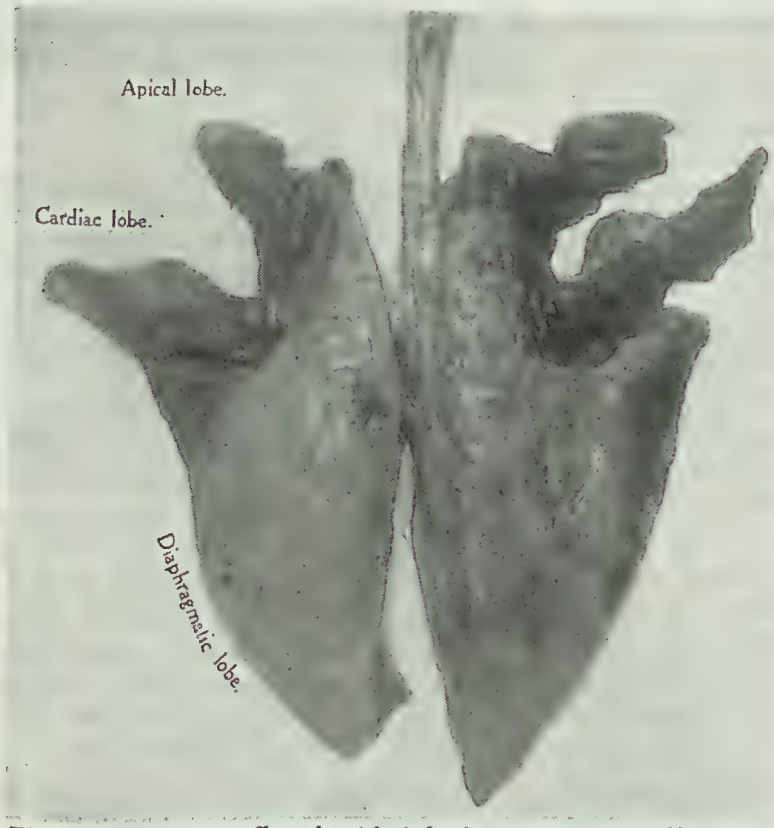
Symptoms.

The course of the disease varies greatly from a very acute type in which sickness is obvious and death may follow in 12 to 24 hours after the onset of symptoms, to a very chronic type in which symptoms are practically absent and the affected pig may even appear to thrive. In the acute cases there is a high fever with temperatures going up to 105° to 106° F.; there is a consequent loss of appetite, and the pig mopes and loses interest in its surroundings. The gait of the affected pig is usually of a staggery nature, and pneumonia is manifest by the uneven, difficult, and jerky nature of the breathing, and sometimes by a short frequent cough also. Diarrhoea may set in and hasten the end of the affected animal. Bluish-red or purple blotches may appear in the skin and are especially noticeable in white pigs.

In the less acute cases the above symptoms are modified, and in the chronic form of the disease only the pneumonic symptoms will be noticeable as the symptoms induced by the fever are absent. Such chronic cases represent a real danger as pigs affected with this type of the disease will apparently do fairly well and may even put on weight and fatten, yet

they are a constant source of infection to any healthy pigs with which they may come in contact

A hurried examination will not reveal the chronically affected animal; but time and patience and a close study of the normal respiratory or breathing movements of a healthy pig, will sometimes allow a confident diagnosis of the chronic type of infectious pneumonia to be made. It will readily be seen that the respiratory movements of the pig are best studied by a careful observation of the movement of the flanks. In the healthy animal the flank movements, coinciding with breathing, are essentially even and smooth; in the pneumonic pig there is a noticeable jerk or kick associated with each movement of the flank, as extra muscular exertion is required in the effort to overcome the disability of the non-functioning portions of the lung. It is this "kick in the flank" which is so typical of infectious pneumonia of swine. It is quite obvious in the acute and less obvious, but still noticeable, in the chronic cases.



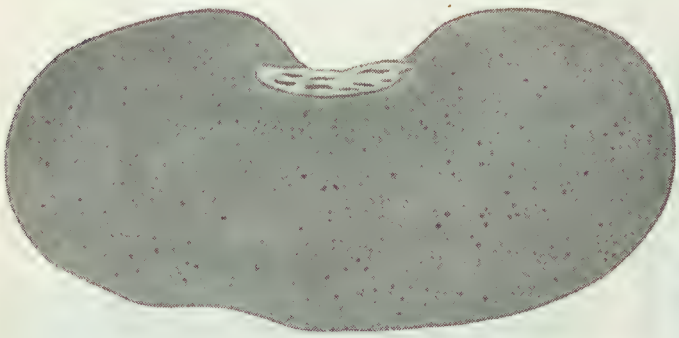
The lung of a pig affected with infectious pneumonia. Note consolidation of the apical, cardiac and anterior portion of the diaphragmatic lobes.

Post-mortem Findings.

In the pig that has died in the acute stage of the disease, nothing of a very obvious nature may be seen when the carcass is opened up. There will be a degree of congestion of the lungs and the associated lymph glands will be hæmorrhagic (blood stained). Some early pleurisy may also be evidenced by discolouration of the membrane covering the lungs. A close examination will reveal tiny pin-point hæmorrhages under serous and mucous membranes and on the surfaces of the kidneys, especially when the capsules of those organs have been peeled off. (See illustration).

If the animal dies or is killed in a less acute or chronic stage of the disease, definite pneumonic lesions will readily be recognizable in the lungs. These lesions are usually found at the extremities of the apical or cardiac lobes of the lung (see illustration) and take the form of reddish consolidated areas of lung tissue. Associated with these lesions is often a degree of inflammation of the stomach and intestines. In diagnosing, remember that normal lung tissue is quite spongy to the feel, while pneumonic lung feels firm and solid and resists the pressure of the fingers. A simple test that can be carried out to differentiate normal from pneumonic lung is to cut off the suspected portion and place it in a small quantity of water; pneumonic lung will sink whereas normal lung will float.

If pneumonia is diagnosed at post-mortem it will be necessary to make sure that it is not due to a lungworm infestation, but this can be readily done as lungworm pneumonia usually appears as a triangular area in the basal or diaphragmatic portion of the lung, and if the smaller air passages are traced out the offending lungworm can be seen. Further, the pneumonia may be due to the irritation caused by the passage o



The kidney of a pig affected with infectious pneumonia. Note small haemorrhages on the surface of the organ.

the larvae of the round worm *Ascaris lumbricoides*, but these lesions are very small and scattered and not confined as they are in infectious pneumonia.

If infectious pneumonia is suspected, the lungs should be preserved in a solution containing 4 fluid ounces (eight tablespoons) of formalin in a gallon of water, pending a visit from the local Stock Inspector, who should at once be notified.

Prevention and Control.

It has already been stated and it may be stressed again that the occurence of the disease on a property can be prevented by good management. If strong robust litters are bred and are brought along in hygienic surroundings without receiving a growth check or being brought into contact with diseased pigs, there need be little fear of the ravages of infectious pneumonia. Two systems of pig raising are commonly adopted in Victoria, viz., the open-air or paddock system and the sty system. Of the two the Department of Agriculture has always been an advocate of the former. This expression of opinion is based on many years experience in dealing with diseases of pigs generally, and it has always been noticed that in comparable conditions, hardier, healthier and more robust pigs are bred and reared in the paddock than in the sty.

The selection of a site for a piggery is a matter of prime importance, as good drainage is essential and the soil should be of such a nature that it will not become a quagmire in wet periods. It should also be capable of growing a good pasture.

The pigs' quarters should be clean, dry, warm and free from draughts, yet provided with good ventilation. These factors should be carefully considered when planning the erection of shelter sheds, &c., as also should the ease of cleaning them; for if a shelter shed can be cleaned and disinfected easily, it is usually cleaned and disinfected well.

Feeding should always be regular and the diet balanced to suit the requirements of the various types of pigs.

Transportation and exposure in markets are very real factors in reducing the vitality and resistance of pigs, thus allowing the germ or organism of infectious pneumonia to gain the ascendency and initiate the disease The buyer of store pigs is always liable to experience an outbreak of this disease. A history of deaths or sickness in a piggery following a recent introduction of purchased pigs is always highly indicative of infectious pneumonia. When it is necessary to introduce new pigs into the piggery, every precaution should be taken to ensure that they do not bring in and disseminate disease. Be sure that the pigs come from a property that has no recent history of infectious pneumonia and be sure that the pigs are strong and robust before purchase. On the journey attend to the comfort of the pigs and thus reduce the possibility of a check with its consequent lowering of resistance. At the piggery, the pigs should be received into a pen or paddock which is completely isolated and they should remain under quarantine and observation in this paddock for a period of three weeks, before being allowed to come into contact with other pigs on the property. The acute or virulent form of the disease, if present, can usually be detected during this quarantine period of three weeks, and its spread is thus controlled. Although even this procedure is not 100 per cent. effective in preventing the introduction of disease, it certainly does minimize the danger, firstly of buying the disease, secondly of incubating the disease during transport, and thirdly of disseminating it through an otherwise disease-free piggery.

There is no known treatment or cure for infectious pneumonia of swine, neither is there any vaccine or serum that can be used as a preventive or which will give any protective immunity to the disease. All pigs must be regarded as susceptible, hence it behoves the pig owner to adopt those methods that will prevent the introduction of the disease and also which will cause only strong healthy pigs to be raised on his farm.

Clean Milk and Dairy Farm Competition

Bayles District

By N. E. Osler, Dairy Supervisor

WITH a view to improving the condition and also the quality of milk supplied to its depot, for distribution in the metropolitan area, the Bayles Dairy Company inaugurated a clean milk and dairy farm competition in July, 1938. The competition was limited to suppliers under contract to the depot. Entry was voluntary and all judging was done by officers of the dairying division of the Department of Agriculture.

While it is generally recognized that there has been considerable improvement in the conditions under which milk is produced, there is still plenty of room for improvement. Not all farmers understand exactly how harmful bacteria can be when they are given suitable conditions for development. Milk is well known as a very suitable media for the growth and multiplication of many kinds of harmful micro-organisms.

The cowshed of Mr. W. Huntingford, winner of the competition, showing clean, well-kept bails and floors.

These competitions, because of their educational value are being encouraged by those interested in obtaining a cleaner milk. The hope of the organizers is that they may be able to demonstrate, in a friendly manner, that it is quite within the scope of every dairy farmer, no matter how small or large the dairy farm, to produce milk of high quality. After all it is the human element which finally controls the conditions which make for a first class or inferior article. It is not so much expensive outfits or elaborate buildings which ensure a perfectly clean milk, although it is a well-known fact that good, sound, convenient premises of a reasonable standard are very helpful in maintaining a high grade milk. No matter how good the buildings, unless a few chief factors, particularly in regard to cleanliness, receive due attention, the milk will not be of choicest quality. Those factors are:—disease-free cows, washed and dried udders, clean hands and sterile utensils, coupled with cooling the milk to as low a temperature as possible. If these simple precautions are strictly adhered to good results should follow.

The competition was divided into two sections; Section 1 being for total number of points scored for every subject item judged. Section 2 was for the points awarded for sediment test, methylene blue reductase test for bacterial content, and temperature of the milk when delivered at the depot. These latter factors were considered so important by the Bayles Dairy Company that they decided to give a silver cup as a special trophy to the winner of this section. Each of the competitors were entered for both sections.

Subject items judged in Section 1 were as follows:—Condition, health, and appearance of dairy stock, maximum points 50; water supply for stock, 60; fodder supply for stock, 60; general management of stock, 80; general arrangement of farm buildings, 60; cowshed, freedom from odours, &c., 120; cowyard situation, surface, drainage, 80; manure disposal, 60; dairy buildings, 120; utensils, milking machines, separator, 140; water supply for cooling, 80; water supply for washing, 100; methods of washing and sterilizing, 140; precautions to ensure cleanliness, 120; special features, 40; sediment wad test, 70; bacteria count, 90; temperature, 70.

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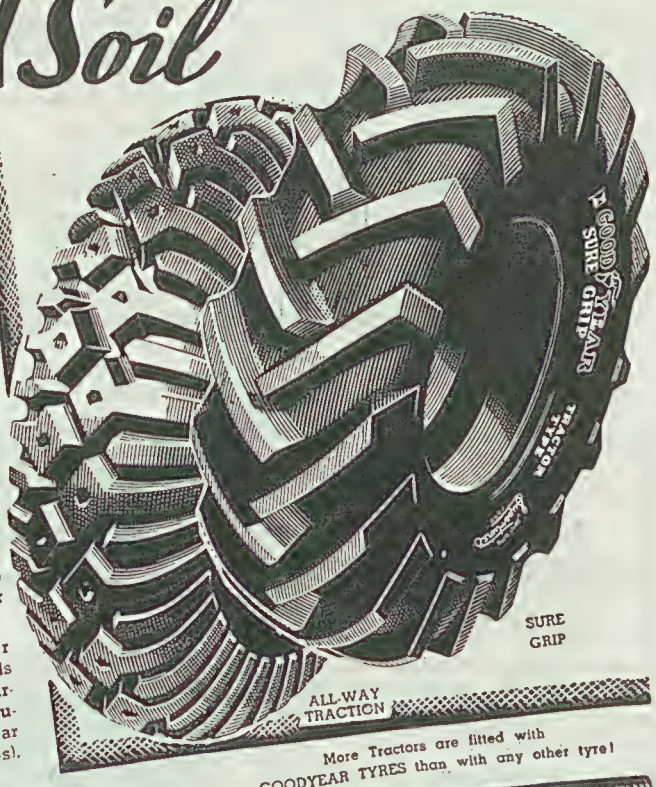

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Taking into consideration all the items of Sections 1 and 2, practically nothing of importance was missed. The number of entries received was regarded as highly satisfactory considering it was the first competition of its kind to be held in the district.

Each farm was visited twice by the judges. The first judging, that of items in Section 1 only, took place late in September and early October. The second judging was made early in January and on this visit the sediment test wads were secured on the farm. In cases where machines were being used wad tests of the milk direct from the releaser and of the strippings were taken. Where hand milking was practised two wads were taken straight from the milker's bucket from two consecutive cows. The methylene blue test and temperature were taken as the milk was delivered at the depot.

Most competitors took a keen interest in the competition and were eager to avail themselves of any suggestions that would improve dairy practice and sanitation.

The Awards.

In winning the first prize in Section 1 with a score of 1,459 points out of a possible of 1,640, Mr. W. Huntingford, of Bayles, registered an excellent performance. About twenty cows are milked, by hand, all the year round, on this 59-acre farm. The cowshed, cooling room, and wash room are all under the one gable roof, but the regulation 6 feet air space between cowshed and the cooling and wash rooms is provided. The whole structure has weatherboard walls, galvanized iron roof, with concrete wall bases and floors throughout. The cowshed has four milking bails and is open to the north-east.

The floors are well graded so as to drain freely. A concrete drain carries all liquid away from the shed. The inner surfaces of the buildings are neatly limewashed and a section from the floor 1 ft. 6 in., up the wall is painted with a non-odourous bitumen paint. The cooling room is 8 feet x 10 feet, lined with galvanized iron up 4 feet from the floor, ceiled, well ventilated, and flyproof. The remainder of the lining is to be completed later. A small door through the wall to a stand is convenient when loading milk cans. This saves wear on the floor and facilitates easy loading.

The wash room is slightly smaller and is fitted with a copper and galvanized iron wash trough. A draining rack for cans completes the arrangement. An adequate supply of cold water for cooling is obtained from the concrete underground tank near the cool room. Rain water from the roof is run into an iron tank and used for washing purposes. Clean water for washing udders and hands, and clean towels are provided at the shed. Portion of the yard is concreted. The foremilk from each cow is tested for any abnormality. Mr. Huntingford does not feed his cows in the milking shed. He believes in giving the cow all she needs to eat in the paddock.

It is interesting to note that when Mr. Huntingford bought this property, a little over twelve months ago, it was not subdivided and there were no buildings on it, except for an old shed. Since then a new house and a new cowshed have been built.

Second prize was awarded to Mr. A. S. Barker of Vervale, who was only two points behind the winner. About 25 cows are milked on this farm all the year round. A bucket type milking plant is used. Mr. Barker depends entirely on a very able assistant in Mr. George Richardson, who takes a very keen interest in the work of conducting an up-to-date dairy farm. A very high standard of dairy cleanliness is maintained on this farm.

The cowshed is of the open type, neatly limewashed and the lower portions are tarred black. Portion of the cowyard is concreted. A large drinking trough is situated in the cowyard. The cooling room is a detached concrete building with galvanized iron roof. It is limewashed inside, ceiled, vented, and flyproof. A suitable wash room is attached. A heater and trough constitute the sterilizing outfit. A can

Showing the milking shed of Mr. A. S. Barker, who gained second place in the competition.

room is adjacent to the wash room where suitable racks are provided, for cans and utensils. An ample supply of water is pumped from the Bunyip River for cleansing floors and drains and also for cooling purposes. Mr. Barker intends to put down an underground tank to ensure a cooler supply of water during the hot weather.

The foremilk from each cow is closely examined for mastitis or any other abnormality. Warm water is provided for washing udders and hands. The stools and leg-ropes are scrubbed and kept clean. On every side were signs of neatness and good management. A neat lawn and garden around the attractive home indicated that a little more than the average care was bestowed upon it.

The wash room, cooling room and airspace in Mr. Huntingford's shed. The top of the underground tank can be seen in the airspace.

Third prize was awarded to Mr. J. McQualter of Nar-nar-goon, who scored three points only less than Mr. Barker. Mr. McQualter is a very consistent supplier of high quality milk to the Bayles depot. The cowshed is of the enclosed type, six bails being used. The floor is of concrete and the whole of the interior of the cowshed is neatly limewashed. All droppings within some distance of the buildings are collected on a barrow daily and removed to a heap some distance away.

Two separate rooms are used for cooling and washing utensils. These are situated rather far from the cowshed for the most convenient working. A copper is used to provide boiling water. The cooling room is lined with sheet iron and limewashed inside. The floor in each room is impervious. Two coolers are used for cooling the milk and an icy cold supply of water is always available from the bore near the cooling room. This is pumped into a 1,000-gallon iron tank and gravitated through the coolers. Mr. McQualter and family do the milking by hand. The yards are gravelled and the surroundings are exceptionally clean.

In Section 2 Mr. Huntingford again was successful. He scored 207 out of a possible 230 points. This was the most interesting section of the competition as the exact results of all efforts towards cleanliness were revealed. Mr. Huntingford supplied the coolest milk to the depot on the day on which the tests were taken. The temperature was 60° Fahr. and the bacteria count was 20,000. The wad test was also very good, 62 points out of a possible 70 being scored.

Second prize in this section was won by Mr. B. McMaster with 200 points. Mr. McMaster, who has not long been on this farm, was well rewarded for his painstaking efforts to ensure cleanliness. The dairy premises on this small area are very neat and tidy. Many more improvements are to be effected, thus making it easier to maintain a high standard in dairy sanitation.

Points of Interest.

Some very interesting facts were learned from the sediment test wads. The first three pairs of wads gaining highest points were from hand milked herds. Machine milk tests wads taken straight from the releaser were very good and in most cases better than those obtained from hand milking, but when the strippings test was taken, to make the pair, it more than usually offset any points gained by the machine milk wad. The strippings wads were usually dirty but some were fair. At the time when the wad tests were taken, i.e., mid-January, the weather was not conducive to good clean sediment wads. There was a fairly strong wind blowing almost every day and in peat country, such as is found around the Bayles district, the dust was exceptionally bad.

The results indicated that greater care could be taken with the washing and the drying of cows' udders, teats, and milkers' hands, and brushing cows' flanks to remove dust; also in keeping the cowshed atmosphere free from dust

[*Continued on page 377.*

Potato Manurial Trials

Results for 1938-39

By G. H. Mattingley, Potato Field Officer

THE early-sown section of the potato manurial trials conducted by the Department of Agriculture, and consisting of three plots, is situated in the Western District where the greater bulk of the potato crop is sown during the months of July, August and early September. Early sowing in this area is rendered necessary because, in a normal year, the rainfall is not sufficiently reliable during the growing period to fulfill the requirements of late sown crops; and is practicable because of the scarcity of frosts, being adjacent to the seaboard. Of course, a certain percentage of the area, particularly around Koroit, is late sown; but over a period of years late sowing has proved to be a decided gamble against weather conditions.

The season just past has been most abnormal. The Western District has experienced one of the driest years on record consequently the yields of farm produce, particularly that requiring abundant rainfall, have been greatly reduced. Potato crops sown in August met with exceptionally dry conditions throughout the whole period of their growth, resulting in such light returns that, in many cases, digging was not attempted. The severity of the dry spell can be gauged from the fact that the grade standard for new potatoes had to be lowered from 1¾ inches to 1¼ inches to enable growers to market a payable proportion of their crops.

Potato manurial trials have been conducted at Illowa and Koroit since 1928-29, but as the duration of the tests on some of the manurial dressings has been shorter than on others, it has been thought desirable to present the results for a lesser period in order to place all manurial treatments under test on an equal basis in point of time. It should also be noted that the yields of marketable tubers quoted for these three plots are the yields of potatoes conforming with the "new potato" grade standard.

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Ploughing, manuring and planting the potato crop.

Coragulac.

The plots at Coragulac were sown on 2nd September 1938 with the Up to Date variety. The soil was a deep, black, volcanic loam, overlying scoria, which is typical of the district and which, on analysis, appears to be well supplied with plant foods. The area had been in potatoes the previous year for the first time after several years of grass, prior to which it had been cropped heavily with onions. In May 1938 the paddock was ploughed and oats drilled in. These were fed off by stock, and the second growth ploughed down on top of the potatoes.

Conditions at planting time were dry and continued so throughout the season with the result that very poor growth was made. The soil became hard and baked because the lack of rain did not permit the normal cultivations to be made. During the season no difference was noticeable between the plots, and when harvesting was carried out on 19th January

1939 the normal test pieces were dug and weighed, but no appreciable differences in yield between the various manurial dressings and the un-manured section were apparent. The average yield over the whole of the plot was less than ½ ton per acre.

The results obtained are shown in Table I.

TABLE I.—POTATO MANURIAL TRIALS, CORAGULAC, 1938-39.

Manure per Acre.	Weight Marketable Tubers.	
	T.	C.
Super. 2 cwt. per acre	0	11
Super. 3 cwt. per acre	0	9
Super. 4 cwt. per acre	0	8
No manure	0	6
Super. 3 cwt. + amm. sulph. 1 cwt. ..	0	8
Super. 3 cwt. + amm. sulph. 2 cwt. ..	0	9

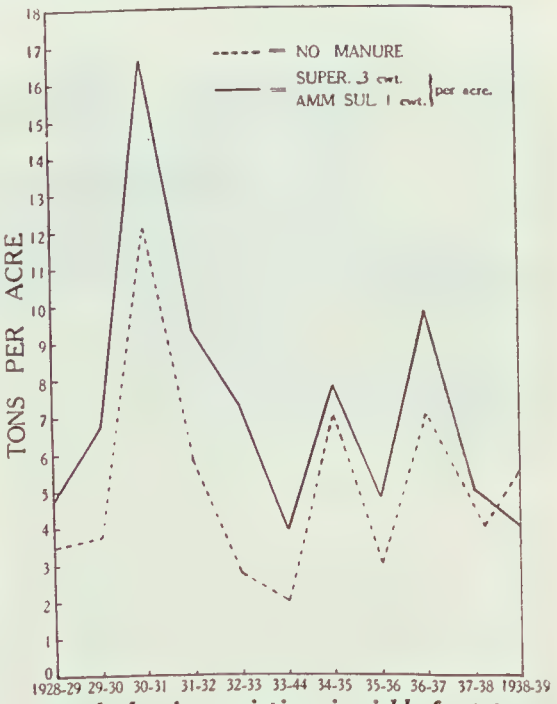
It is perhaps unfortunate that the first two years of the tests at Coragulac should have suffered such abnormal weather conditions. The previous season was most erratic, and, although the plots yielded in the vicinity of 6 tons of potatoes per acre, there was no significant increase in yield due to the use of any one particular manurial treatment.

It is proposed to carry on for at least three more years in order to endeavour to include as wide a range of seasonal conditions as possible; but at the present juncture, the only observation that may be made is that the use of manures seems to be of no advantage at Coragulac in a dry season.

Illowa.

On 1st August 1938 the Illowa plots were sown on a friable red volcanic soil that had been in grass for the previous two years after having been cropped with onions for seven years continuously. No preliminary cultivations were given, the potatoes, Manistees, being planted straight under the sod. The usual practice in this district is to leave the land out in grass for a longer period, but in this instance the pasture had been severely damaged by cutworms and was, of necessity, ploughed under.

Planting was done under dry conditions which persisted throughout the season, rendering the manures applied of little value and probably accounting for the surprising result shown in Table II. where the unmanured plot gave the highest return. This was only a vagary of the unusual season and is not substantiated in the results for a long period.



Graph showing variations in yield of potatoes at Illowa.

These definitely show that an appreciable increase may be obtained by the use of artificial fertilizers. In Table III. the average results obtained during the last six years are shown.

TABLE II.—POTATO MANURIAL TRIALS, ILLOWA, 1938-39.

Manure per Acre.	Weight Marketable Tubers.	
	T.	C.
Super. 2 cwt.	4	0
Super. 3 cwt.	3	19
Super. 4 cwt.	4	1
No manure	5	11
Super. 3 cwt. + amm. sulph. 1 cwt. ..	4	1
Super. 3 cwt. + amm. sulph. 2 cwt. ..	3	15

TABLE III.—AVERAGE RESULTS, ILLOWA, FOR SIX YEARS, 1933-34 TO 1938-39.

Manure per acre.	Average Yield.		Percentage Increase.
	T.	C.	%
Super. 2 cwt.	5	9	15
Super. 3 cwt.	5	15	21
Super. 4 cwt.	5	17	23
No manure	4	15	..
Super. 3 cwt. + amm. sulph. 1 cwt.	5	18	24
Super. 3 cwt. + amm. sulph. 2 cwt.	5	16	22

Koroit.

Because no land was available at Koroit this season, plots were planted on 1st September on a black volcanic soil at Woodford, which was of similar type to that generally used nearer Koroit. The land had grown onions for the preceding two years and potatoes for the three years previous to that. It was ploughed in June, harrowed and rolled twice and planted behind a single-furrow plough.

The variety Brownell was used and, as was the case over the whole of the Western District last season, made very poor growth indeed. On 18th January the plots were harvested giving the results set out in Table IV. These of course are somewhat erratic, but the average results shown in Table V. indicate that a definite and consistent increase in yield may be obtained by the utilization of artificial manures at the rates specified.

TABLE IV.—POTATO MANURIAL TRIALS, KOROIT, 1938-39.

Manure per Acre.	Weight Marketable Tubers.	
	T.	C.
Super. 2 cwt.	2	17
Super. 3 cwt.	3	10
Super. 4 cwt.	3	9
No manure	3	6
Super. 3 cwt. + amm. sulph. 1 cwt. ..	3	1
Super. 3 cwt. + amm. sulph. 2 cwt. ..	3	6

TABLE V.—AVERAGE RESULTS, KOROIT, FOR FIVE YEARS, 1934-35 TO 1938-39.

Manure per acre.	Average yield.		Percentage Increase.
	T.	C.	%
Super. 2 cwt.	6	12	7
Super. 3 cwt.	7	4	17
Super. 4 cwt.	7	3	16
No manure	6	3	..
Super. 3 cwt. + amm. sulph. 1 cwt.	7	4	17
Super. 3 cwt. + amm. sulph. 2 cwt.	7	9	21

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

ACCREDITED TUBERCLE FREE HERDS.

Herd Number.	Name.	Address.	Number in Herd.	Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	190	12	Black, Estate, Late I. S.	"The Cottage," Mount Noorat	44
2	Warragul High School	Warragul ..	35				
3	Payne, A. E. T. ..	"Yarra View," Lilydale	80	13	Read, John D. ..	"Springhurst Estate," Springhurst	99
4	Dennis, Mrs. A. A. ..	Frankston ..	14				
5	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	99	14	Kelly, C. ..	"Glenmore," Creighton's Creek, Euroa	22
6	Harris, J. W. ..	"Rowena," Clyde	72	15	Gorman, A. W. ..	"Cathcart," Alexandra	64
7	School of Horticulture	Burnley ..	8				
8	Lawrence, P. H. ..	"Rainga," Tarrawarra	59	16	Samuel, B. T. ..	Lang Lang ..	72
				17	Powell T. S. ..	"Carellen," Mansfield	48
9	Banyule Stud Pty. Ltd.	Heidelberg ..	54	18	Dunbar & Clark, Messrs.	"Hazeldean Dairy" Mount Dandenong	16
10	McIntosh, John ..	"Burnwood," Merrigum	31				
11	Black, Mrs. Agnes ..	Mount Noorat	40				

Entero-Toxaemia of Sheep

(Pulpy Kidney)

By R. J. de C. Talbot, B.V.Sc., Chief Veterinary Inspector

Owing to the present abundance of succulent green pasture Entero-Toxaemia of sheep is even more troublesome this year than usual. In view of the large number of enquiries received by the Department during the past few weeks it has been thought desirable, once again, to bring before the notice of all sheepowners the preventive measures to be adopted in combating this disease.

IN recent years much attention has been paid to diseases of sheep, and, as a result, it has been learned that many of the outbreaks of what was once termed Braxy-like disease are, in fact, manifestations of quite different diseases, such as black disease (infectious necrotic hepatitis), which is due to an organism producing its poison in the liver tissues destroyed by the immature fluke in its journey toward a bile duct; or entero-toxaemia, which is due to the absorption of poison produced by a quite different organism in the small intestines.

Entero-toxaemia has been discovered in every State in Australia except Queensland and in New Zealand. It was first noticed in Western Australia in 1915 in the Beverley-York district, and became known as the Beverley disease. It at first appeared to be confined to one or two properties, but soon made its appearance over a wider area, and quickly began to assume serious proportions. Various theories were held as to its cause, and investigations were carried out on behalf of the Western Australian Government without conclusive results. In 1925, Dr. Bennetts, Veterinary Pathologist to the Western Australian Department of Agriculture, commenced his investigations into this disease, and we are indebted to him for its solution, for the excellent description of the disease, and for his researches published in Bulletin No. 57 by the Council for Scientific and Industrial Research. He found that it then existed in the south-west portion of the State, covering an area bounded on the east and west by the lines of settlement, and extending, roughly, 380 miles north and south. Its incidence is greatest in the richest and oldest cultivated areas of the State, where top-dressing has been practised, and the growth of improved pasture encouraged. The mortality varies considerably from year to year both as regards the districts and the individual properties. Losses commence with the appearance of green feed after the autumn rains, and continue until the dry weather sets in.

In Victoria this disease affects mainly young lambs up to the age of sixteen weeks which are on rich feed, and in good condition. Cases occasionally do occur, however, in aged or store sheep. All breeds may develop the disease, although those which put on condition more rapidly, such as long-wools or cross-breds, appear to be more susceptible or more frequently affected. The fact that these breeds are commonly kept on the more nutritious pastures may, however, have some bearing on their apparent greater susceptibility which, by the way, is not influenced by sex, as rams, ewes, or wethers may develop the disease.

Symptoms.

Sheep which develop the disease usually die suddenly, and as owners very rarely see a sick sheep, the symptoms consequently are not well known. The sheep are found dead on the camp in the morning, or they may lie down quietly and die in the paddocks during the daytime without attracting notice. Two types of symptoms have been observed and described by Dr. Bennetts; one characterized by coma and quiet death, the other by convulsions. He states that in the first type there is an initial stage characterized by a staggering gait with "knuckling over" of fore limbs. The sheep moves about with nose to the ground, chewing dirt, sticks, &c., and soon lies down on its

side with its head turned to the left flank. In this stage it remains quiet, unless disturbed, when there may be attempts to rise, perhaps actual movement for a short distance before again lying down. Salivation and champing of the jaws are common, and there may be evidence of hyper-sensitiveness, particularly in the region of the flanks. Blindness and unconsciousness soon follow, and the respiration becomes accelerated (up to 180 per minute), shallow, and irregular. Bloating may become marked before death. The temperature usually remains normal, although a rise to 106°F. was observed in one case. Death takes place quietly, usually three to four hours after the appearance of symptoms, although in rare cases it may be delayed for 24 hours.

In the other type of symptoms, the animal, only slightly dull, is suddenly seized with convulsions. Lying on its side, it exhibits, almost up to the point of death, more or less violent galloping movements, associated with twitching of muscles, rolling of eyes, grinding of teeth, excessive salivation, and later, pronounced rigidity of the body, in which the head is thrown back and the spine arched. Death occurs usually within two to four hours.

The convulsive type is the more uncommon, and is seen in lambs more frequently than in adult sheep.

In this disease there is some evidence of a period of incubation. If an affected flock be moved from the pasture on which deaths are occurring, to a poorer pasture, a few deaths may be noted up to the second, rarely up to the fifth day, after which no further losses

Sheep affected with infectious entero-toxaemia (comatose type)—half-hour before death.

are experienced. The carcass is almost invariably found on post-mortem examination to be that of a well-nourished animal. Almost all cases show evidence of recent scouring. Seen immediately after death, the blood vessels under the skin may be slightly injected, while those of the mesentery or skirt of the bowels are markedly so. The first three stomachs appear normal, except that the rumen may contain gas, and the food content is rather liquid. The fourth stomach is injected on its outer surface, and the inner lining may show a few patches of slight congestion.

The small intestines usually contain more gas and less food than those of the normal sheep, and the inner lining shows scattered areas of congestion. The large intestines are usually

Sheep affected with the convulsive type of entero-toxaemia—one hour before death.

normal, although patches of congestion sometimes occur in the caecum. The mesenteric lymph glands are frequently slightly congested and oedematous, while the liver is congested and easily broken down. The gall bladder is distended with thick dark bile, and the kidneys show slight congestion, particularly toward the outer border. Post-mortem degeneration occurs very early, " pulpy kidney " being found in carcasses opened even one hour after death. This fact led to the disease being called pulpy kidney in Victoria and New Zealand, where it was considered to be due to feeding on over-rich pasture.

All other organs are normal or show only very slight changes. It has been frequently noted that where viscera, such as the heart, liver, or kidney are left on dishes exposed to air for an hour or so after removal, those parts showed a bright red colour. The explanation of this phenomenon is not clear. Careful microscopic examination of all organs and tissues revealed nothing diagnostic, but a micro-organism was found to be constantly present on the inner lining of the small intestine.

Attempts to cultivate micro-organisms from the various tissues, using a variety of culture media were generally negative, and in 1926 Bennetts suggested that the disease might be due to the absorption of poisons formed by micro-organisms in the stomach or small intestine, and subsequently proved this theory to be correct. The contents of the small intestine of sixteen affected sheep were passed through filters which removed all micro-organisms, and a small dose of each filtrate was then injected into a guinea pig. In fourteen cases the death of the experimental animal occurred. Filtrates from the intestine of normal sheep were also tested, and did not cause the death of the experimental animal even when used in much larger doses. Cultures of the micro-organism were grown, and after considerable difficulty a method was perfected by which the toxine or poison could be secured from cultures of these bacteria, which was subsequently named "bacillus ovitoxicus" by Dr. Bennetts.

Experimental sheep, inoculated with toxine prepared from cultures or from the intestinal contents of affected sheep, died after showing symptoms exactly similar to those observed in the field. Attempts to infect sheep by feeding them with cultures of the bacillus failed, until a method of inducing bowel stasis, by the administration of opium and belladonna in milk at the time of feeding the culture was evolved. Using this method, four out of six sheep dosed developed the disease and died. It would appear, therefore, that a sluggishness of the small bowel is a factor of prime importance in the development of the disease. Fibre is essential to bowel activity, and its absence in luscious green pasture may explain why the disease is more common on green pasture, and why feeding on dry feed which is rich in fibre acts as a preventive, as does compulsory daily exercise. Injury to the lining membrane of the bowel may also be a predisposing factor. The disease has occurred on properties heavily infested with stinkwort, the hairs of which cause bowel irritation.

Prevention.

Two types of vaccine for the prevention of entero-toxaemia are prepared by the Commonwealth Serum Laboratories; these have proved most effective on many infected properties. With one type of vaccine the treatment for lambs consists of the injection of two doses at an interval of four weeks, the first, 2 c.c. and the second, 5 c.c. For adult sheep the first dose should be 3 c.c. and the second 7 c.c. On properties known to be infected young lambs should be given the first dose as soon after birth as possible. If this is done, full immunity is established by the time the lamb is seven weeks old.

With the second type of vaccine, which is known as Entero-toxaemia Vaccine, Alum Precipitated, a single dose of 5 c.c. is injected, this is sufficient to confer immunity and only when a heavy death rate is expected is it recommended that a second dose be given after an interval of one month. This latter type of vaccine causes a lump at the site of injection which usually persists for some time. It may cause a blemish to the dressed carcass. Therefore it is not recommended for the vaccination of lambs destined for export.

When it is desired to protect young lambs against entero-toxaemia by vaccinating the ewe during pregnancy, and sheep owners are recommended to adopt this procedure, one dose of 5 c.c. of the alum-precipitated type of vaccine should be injected at or about the time of mating and a second dose of 10 c.c. about a fortnight before the due date of lambing. As the immunity of the ewe is transferred to the lamb in the colostrum or "first milk" it is important that lambing should occur at the time of greatest response to the second dose of vaccine. As the maximum response occurs ten to fourteen days after the injection it follows that the ideal time to give the second dose is ten to fourteen days before lambing.

Recently a comprehensive survey of a large number of properties on which cases of the disease have occurred was carried out by officers of the Live Stock Division of the Department of Agriculture, and as a result it has been established that the disease may be controlled and the mortality reduced to a minimum if the ewes and lambs are vaccinated and a supply of meadow hay is available at all times. A plentiful supply of the lick recommended by the Department of Agriculture should always be available for the sheep. In order to prevent the spread of the disease and the infection of the soil, carcasses of sheep should be burned where found if possible or buried deeply in quicklime.

Full directions as to vaccination of sheep and the precautions which should be observed are contained in the pamphlet "Vaccination of Sheep" which may be obtained on application to the Department.

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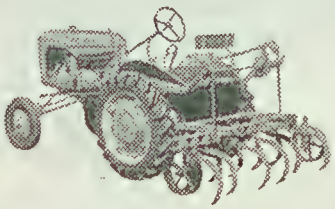

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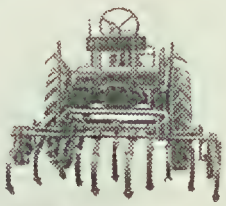

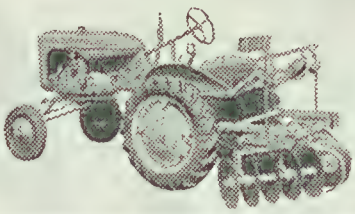

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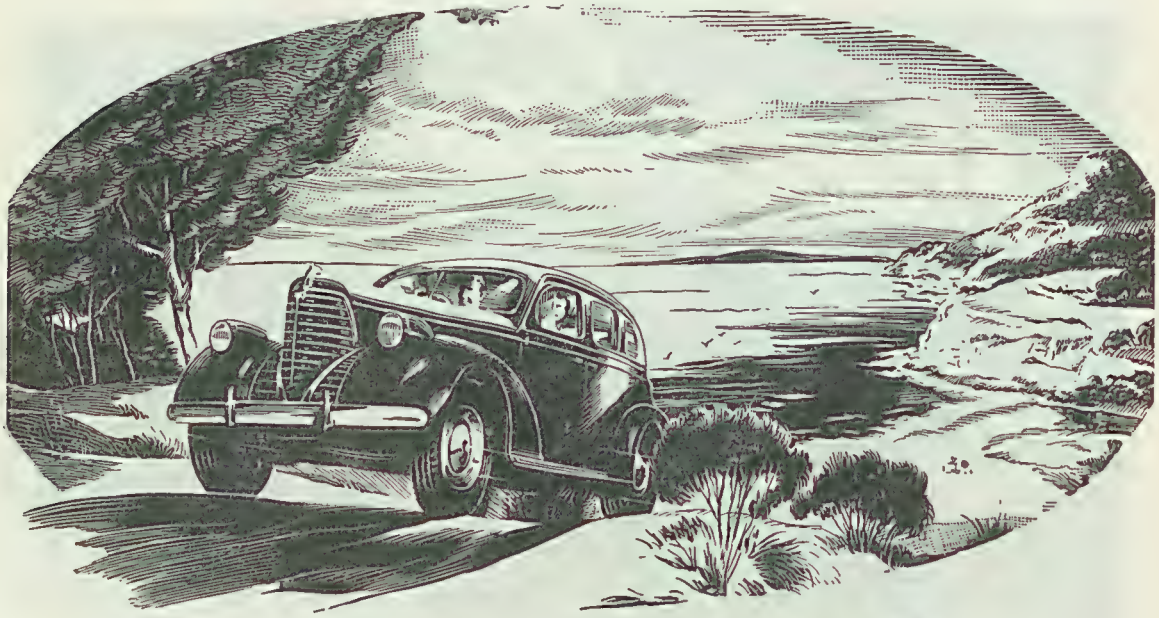

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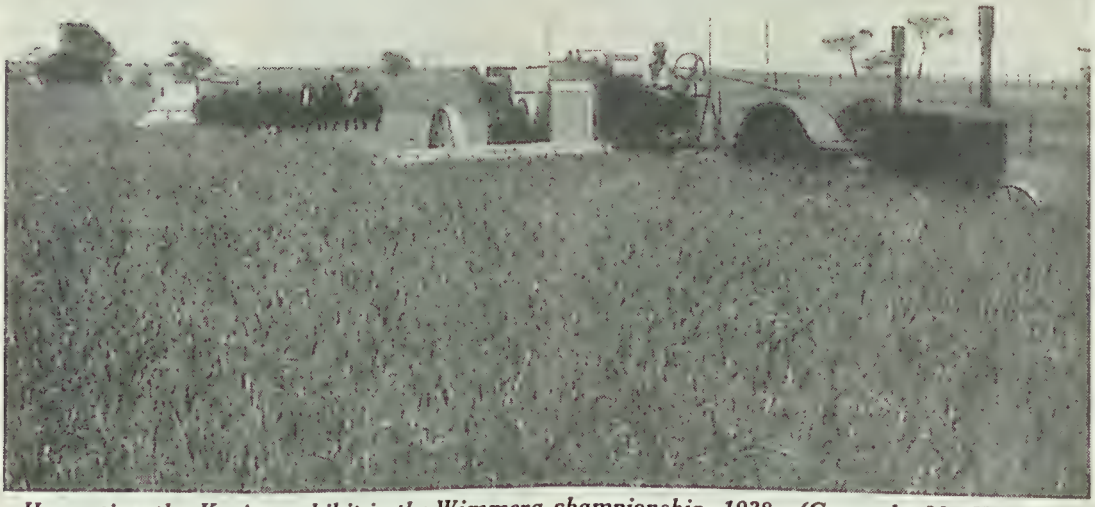
Wheat Crop Competitions

Wimmera and Mallee Championships

By A. B. Hackwell, B.Agr.Sc., Hon. Secretary, Farm Competitions Association*



Harvesting the Kaniva exhibit in the Wimmera championship, 1938. (Grown by Mr. H. Feder.)

THE wheat crop and fallow competitions conducted by local agricultural organizations in the wheat belt, in co-operation with the Department of Agriculture, have been a prominent factor in promoting better wheat-growing methods, and they have contributed, in no small measure, to the general advancement made in wheat farming in Victoria. The contests not only have a stimulating influence on the individual competitors but they also focus attention on the methods employed by the most successful farmers, and this, in turn, leads to a raising of the general standard.

The judging of most of the competitions is undertaken by officers of the Department of Agriculture, and the contests thus provide an opportunity for growers and advisory officers to have personal contact on the farmers' properties and to discuss, to their mutual benefit, matters of interest concerning the crops, the fallows, and other farm operations. The judge is familiar, to a great extent, with the results of the experimental plots and latest scientific developments in wheat growing, and it is his privilege to convey this information to interested competitors. At the same time, he acquires, from conversing with the farmers, many practical points or hints which he may also pass on to others. This mutual discussion and exchange of ideas is a very valuable phase of competition work.

Crop and fallow competitions have assisted in promoting, among other things, a greater use of improved wheat varieties and in disseminating knowledge regarding fallow preparation, the importance of superphosphate and of disease and weed control. An example of the way in which competitions assist in accelerating the use of better varieties was given with Ghurka wheat. In 1933, Ghurka

* Mr. Hackwell is Agricultural Instructor in this Department.

was grown on only 5 per cent. of the wheat area of the State. As a result of the advocacy of the crop judges in their reports and personal contacts with growers and through other means, two years later Ghurka became the main variety sown, occupying, in 1935, actually 35 per cent. of the wheat acreage. In the next three years the area sown with Ghurka further increased, reaching in the past season, 48 per cent. of the total wheat area.

Another illustration of the benefits of the competitions is in connexion with the control of wheat diseases. From the contact which the competitions provide, many wheat growers have acquired a better knowledge of the different diseases and how they breed from year to year, and of the control measures found most practicable. A few years ago, farmers were recommended to try the new dry pickling treatment for combating ball smut disease of wheat, a method which had been proved by experiment to be more efficient and convenient than the laborious wet pickling treatments. In a short time the new method became extensively used, so much so, that in recent years probably 95 per cent. of the wheat crop has been sown with seed treated in this manner, and with consequent marked reduction in the incidence of this disease.

The crop competition movement, accordingly, is of considerable educational benefit. Its value is frequently confirmed by the many wheat growers who have attributed their improved wheat yields, consistent with seasonal conditions, to the encouragement, knowledge, and impetus they acquired through their participation in the competitions.

Commenced at Nhill in 1900, the competitions gradually spread to other districts, and from about 1915 onwards, a marked increase in the number of contests occurred, reaching a peak of 57 competitions in 1928. In the last decade, an average of 30 contests has been held annually, some 400 wheat growers participating each season.

Since 1927, the organization of the crop and fallow competitions has been carried out by the Farm Competitions Association of Victoria, which is comprised of representatives of the Department of Agriculture and some 25 affiliated agricultural organizations in the main wheat districts of the State. The association regulates and co-ordinates the local competitions, arranges for the appointment of judges and for the publication of the reports. A handsome framed certificate is awarded each year by the association to the winning exhibitor in each section of the competitions. In the past season, despite the drought, 27 competitions were held in the wheat districts, seventeen of which were judged by departmental officers and ten by nominated private farmers, and in all 49 certificates were awarded.

District Wheat Championships.

A further progressive step was taken in 1938, when the association decided to inaugurate district wheat championships in various zones of the State, commencing that year with a competition for the Champion Wheat Crop of the Wimmera (50 acres), and to extend later to other districts as opportunity occurs. Ten societies competed for the Wimmera championship in 1938 and, although a drought was experienced that year, the new contest created considerable interest. The Royal Agricultural Society of Victoria donated £50 in prize money for the championship, £40, and a special certificate being awarded to the winning exhibitor,

WIMMERA WHEAT CROP CHAMPIONSHIP (50 ACRES), 1938.

District Agricultural Society.	Competitor.	Type of Soil.	Wheat Variety.	Total Points.
Nhill	H. F. C. Cramer	Black loam	Ghurka	91
Kaniva	H. Feder	Red loam	Dundee	89
Warracknabeal	R. C. Holland	Red loam	Dundee	89
Murtoa	W. W. Schodde	Black loam	Ghurka	85
Jeparit	L. R. Rodda	Sandy red loam	Dundee	84
Rupanyup	C. Mitchell	Black loam	Ghurka	84
Dimboola	A. H. Pietsch	Black loam	Ghurka	84
Wycheproof	E. A. Perry and Sons	Sandy red loam	Ranee 4H	83
Charlton	W. O'Connor	Black loam	Ghurka	83
Donald	A. Bugge and Sons	Red and black mixed land	Ghurka	72

and £10 to the society conducting the local competition which provided the champion crop.

The championship was judged by Mr. W. B. Miller, M.Agr.Sc., Senior Inspector of Agriculture, and the summarized results are shown in the accompanying table.

The Wimmera championship of 1938 was won by Mr. H. F. C. Cramer, of Nhill, with a crop of Ghurka wheat which yielded 32½ bushels per acre, the highest yield in the competition, the grain being well-filled and weighing 64½ lb. per bushel. This return was a very creditable one for such an adverse season, the crop being grown under a rainfall of only 490 points from sowing time in June until harvest. An officer of the Department of Agriculture was present when the exhibit was harvested, and in accordance with the rules certified to the area and yield.

Mr. H. F. C. Cramer's champion Wimmera crop, 1938. Variety, Ghurka; yield, 32½ bushels per acre.

The average estimated yield of the ten crops in the championship was 24 bushels per acre, which was a remarkably high return under the drought conditions, being more than double the average yield of the Wimmera district for the season, namely, 10.63 bushels per acre. Whereas, in a good year the crops on black land would have a considerable advantage, four exhibits grown on red land had the distinction of winning their local competitions in 1938, and participated in the championship.

Championships 1939.

Two championship competitions will be held this year, one for the Wimmera and the other for the Mallee, and both contests will be for the best wheat crop (50 acres) grown on ordinary one-year fallow. The Royal Agricultural Society of Victoria has provided £50 prize money for each competition, and the championship in each case will be open to the best crop in the local competitions, in accordance with the following rules.

For the Wimmera championship this season, it is expected that ten or more societies will again compete. In the Mallee district, competitions have been held in recent years at Beulah, Birchip, Hopetoun, Kerang, Ultima, Walpeup, and in the Millewa, and it is expected that in addition to these seven, other societies will participate. For the Mallee championship the crops must be grown on land generally typical

Inspecting Mr. C. Mitchell's crop at Rupanyup, 1938.

of the Mallee district, consequently certain heavy soils in the "fringe" belt will be excluded.

Any societies in the Wimmera or Mallee not at present conducting a local crop competition and which desire to give their members the opportunity of participating in the district championship, will require to initiate a local contest this year for 50 acres of wheat, and the winning exhibits in these competitions would automatically compete in the championship, provided the other conditions were complied with, as set out hereunder:—

Champion Wheat Crop of the Wimmera.

Prize money, £50.—Donated by the Royal Agricultural Society of Victoria.

The competition will be for the best wheat crop (50 acres) exhibited in the local crop, or crop and fallow competitions conducted by agricultural organizations in the Wimmera District.

The exhibitor of the champion crop will be awarded a cash prize of £40 and a Special Certificate. In addition, £10 will be donated to the Agricultural Society or organization conducting the local competition which provides the champion crop.

The rules for the Wimmera championship are as follows:—

1. (*a*) The Championship shall be open only to the best wheat crops (50 acres in area) exhibited in the local crop, or crop and fallow competitions conducted by Wimmera societies affiliated with the Farm Competitions Association (Victoria).

The best crop (50 acres) in each local competition, as determined by the judge of that contest, shall be automatically eligible to compete in the Championship, provided that all other conditions are complied with. Should the best crop in the local competition be ineligible for the Championship, the best eligible crop may compete.

(*b*) Where there is more than one section in the local competition the best eligible crop (one only) throughout all the sections shall contest the Championship.

2. The exhibit shall be 50 acres in area all in one piece, and sown with one or two varieties of wheat.

Any variety of wheat will be eligible (with the exception of un-named or privately-named cross-breds and selections) and the exhibit must be clearly defined at judging time by hay tracks or stakes.

3. (*a*) The exhibit must be grown on land which was fallowed in the previous year and which in the year prior to that was either under crop (for at least five months) or out to grass throughout that year.

(Land on which fallowing commenced before 1st January of the previous year will be ineligible.)

(*b*) The exhibit or the fallow on which it is grown, must not have been irrigated or artificially watered, either deliberately or accidentally.

4. The Championship shall be judged by an officer of the Department of Agriculture, Victoria, in accordance with the scale of points adopted by the Farm Competitions Association.

5. Any crop eligible to compete in the Championship may be withdrawn from the contest, if, in the opinion of both the judge of the local competition and the exhibitor of the said crop, the exhibit is not of sufficient merit to warrant inspection for the Championship.

6. If an exhibit in the Championship be damaged by storm or other cause prior to the visit of the championship judge it may be withdrawn, with the approval of its exhibitor, in favour of the next best eligible crop in the local competition, but not more than one crop from each local competition shall be judged for the Championship.

7. Each local Society, if required, is to provide motor transport for the championship judge to the next centre where a championship exhibit is to be inspected.

8. In the event of the champion crop being a joint entry from a land-owner and share-farmer, the full prize shall be awarded to the share-farmer.

9. Before making his award the championship judge, should he so desire, may re-inspect any exhibit while it is being harvested.

10. The actual yield per acre of the crop awarded the Championship shall be determined by the Department of Agriculture at harvest time.

11. The contest is primarily intended as a competition between wheat crops grown on fallowed land under ordinary wheat-farming conditions and the judge of the local competition has the right to debar from the Championship any exhibit which he considers does not come within the letter or spirit of the rules.

If he so desires the said judge for the purpose of determining the eligibility of an entry, may require the Secretary or President of the local society concerned to submit a Statutory Declaration from the exhibitor containing such particulars regarding the general treatment the land growing his exhibit received during the previous three years, as the judge considers necessary.

12. Should any circumstances arise not provided for in the rules, the matter shall be decided by the Chairman of the Farm Competitions Association, or his deputy.

Champion Wheat Crop of the Mallee.

Prize money, £50.—Donated by the Royal Agricultural Society of Victoria.

The competition will be for the best wheat crop (50 acres) exhibited in the local crop, or crop and fallow competitions conducted by agricultural organizations in the Mallee District.

The exhibitor of the champion crop will be awarded a cash prize of £40 and a Special Certificate. In addition, £10 will be donated to the Agricultural Society or organization conducting the local competition which provides the champion crop.

The rules for the Mallee championship are as follows:—

1. (*a*) The Championship shall be open only to best wheat crops (50 acres in area) exhibited in the local crop, or crop and fallow competitions conducted by agricultural organizations in the Mallee which are affiliated with the Farm Competitions Association (Victoria).

The best crop (50 acres) in each local competition, as determined by the judge of that contest, shall be automatically eligible to compete in the Championship, provided that all other conditions are complied with. Should the best crop in the local competition be ineligible for the Championship, the best eligible crop may compete.

(*b*) Where there is more than one section in the local competition, the best eligible crop (one only) throughout all the sections shall contest the Championship.

2. The exhibit shall be 50 acres in area, all in one piece, and sown with one or two varieties of wheat.

Any variety of wheat will be eligible (with the exception of un-named or privately-named crossbreds and selections) and the exhibit must be clearly defined at judging time by hay tracks or stakes.

3. Crops eligible for the Championship must be located in the Mallee District, that is in the Counties of Millewa, Weeah, Karkarooc, or Tatchera, *and must be grown on land generally regarded as typical of the Mallee District* (pine and belar land are included in the types eligible).

Crops will be ineligible if grown on—

(*a*) Box land, black land, swamp land.

(*b*) Any land classed by the Committee of the local society concerned (or its nominees) as being not typical of the Mallee District.

In competitions which embrace Mallee Fringe land the crop which represents the district in the Championship must be grown on land which has been approved by the Committee of the local society (or its nominees) as being eligible within the provisions of rule 3—such approval may be given any time before inspection by the championship judge.

NOTE.—To expedite judging, competitors in Mallee Fringe areas should obtain, before the arrival of the judge, a ruling from their local Committee in regard to the eligibility of their particular soil.

4. The exhibit must be grown on land which was fallowed in the previous year and which in the year prior to that was either under crop (for at least five months) or out to grass throughout that year.

(Land on which fallowing commenced before 1st January of the previous year will be ineligible.)

5. The exhibit or the fallow on which it is grown must not have been irrigated or artificially watered, either deliberately or accidently.

6. The Championship shall be judged by an officer of the Department of Agriculture, Victoria, in accordance with the scale of points adopted by the Farm Competitions Association.

7. Any crop eligible to compete in the Championship may be withdrawn from the contest if, in the opinion of both the judge of the local competition and the exhibitor of the said crop, the exhibit is not of sufficient merit to warrant inspection for the Championship.

8. If an exhibit in the Championship be damaged by storm or other cause prior to the visit of the championship judge it may be withdrawn, with the approval of its exhibitor, in favour of the next best eligible crop in the local competition, but not more than one crop from each local competition shall be judged for the Championship.

9. In the event of the champion crop being a joint entry from a land-owner and share-farmer, the full prize shall be awarded to the share-farmer.

10. Before making his award the championship judge, should he so desire, may re-inspect any exhibit while it is being harvested.

11. The actual yield per acre of the crop awarded the Championship shall be determined by the Department of Agriculture at harvest time.

12. The contest is primarily intended as a competition between wheat crops grown on fallowed land (or cover-crop fallow) under ordinary wheat-farming conditions on soils typical of the Mallee District, and the judge of the local competition has the right to debar from the Championship any exhibit which he considers does not come within the letter or spirit of the rules.

If he so desires, the said judge, for the purpose of determining the eligibility of an entry, may require the Secretary or President of the local society concerned to submit a Statutory Declaration from the exhibitor stating such particulars regarding the general treatment the land growing his exhibit received during the previous three years, as the judge considers necessary, and/or that the land in question is eligible to compete under the provisions of rule 3 above.

13. Should any circumstances arise not provided for in the rules, the matter shall be decided by the Chairman of the Farm Competitions Association, or his deputy.

Further information regarding either Championship may be obtained from the secretary of the local agricultural society or from the Honorary Secretary of the Farm Competitions Association (Mr. A. B. Hackwell), Department of Agriculture, Melbourne, C.2.

Clean Milk and Dairy Farm Competition—*continued from page 366.*

during the milking operations. In mentioning these factors the desire is to help farmers to correct faults in these or any other sections where points were lost.

The competition was concluded with a field day and inspection of Mr. Huntingford's property. Approximately 90 people listened to lectures by Mr. A. J. Gill, Senior Dairy Inspector, on dairy sanitation, and Mr. R. L. Twentyman, Agrostologist, on pasture improvement. The trophies were presented by Mr. M. Bennett, M.L.A.

Tomato Diseases and Their Control

By S. Fish, M.Agr.Sc., Biologist

THE main purpose of this article is to present to growers a brief description of the more important tomato diseases present in the State, together with the present methods available for their control. It is important that the grower should have a clear idea of what is meant by the term "disease" as applied to plants. Disease in plants has been described as a disturbance of, or a deviation from, either normal function or normal structure, or both. It may affect the whole plant or only part of it. This disturbance of the vital functions of the plant may be brought about by parasitic or non-parasitic causes. Parasitic diseases may be caused by the following causal agents—virus, bacteria, fungi, eelworms, and insects; whereas non-parasitic plant diseases are caused by improper environmental conditions of soil or air.

The manifestation of disease in plants is called "symptom expression" and usually symptoms are definite for each disease. There are symptoms resulting from the death of plant tissues, such as rot, canker, blight, wilt, damping-off, streak, and burn. There are symptoms which are the results of overgrowths such as are exhibited by the presence of galls, and finally there are manifestations of a slowing down of growth or dwarfing of plant tissues which are striking symptoms of some of the virus diseases.

As tomato growers can identify a disease only by its symptoms, the following key should assist them with identifications. Where difficulty is experienced in this regard, it would be advisable for growers to submit specimens for identification to the Plant Research Laboratory, Burnley, E.1.

A.—Diseases affecting Tomato Seedlings causing them to die off in patches.

(1) Constriction of stem at ground level with seedlings falling over .. .. .. **"Damping-off."**

B.—Diseases affecting the whole plant.

(1) Lower leaves turn yellow with premature defoliation. Roots rotted, minute black bodies seen on wood, core, and on the outer surface of the roots .. .. .. **"Black Dot" Root Disease.**

(2) Wilting of the leaves during the warmer and brighter times of the day during cool weather. Plants usually recover at night and wilt again in the day. Internal browning may be traced from roots, often extending to the top of the plant .. .. .. **Verticillium Wilt.**

(3) Similar in symptoms to (2). Internal browning does not extend to top of the stem. Wilt occurs during hot weather .. .. **Fusarium Wilt.**

(4) Dark-brown areas at collar of the plant. Dense mass of white fungus threads in stem cavity, together with black fungal resting bodies **Sclerotinia.**

(5) Plants become stunted, young growth shows bronze, stippled spots .. .. .. **Spotted Wilt.**

(6) Slight stunting of plants and rolling of the young leaves **Mosaic.**

(7) Dark, sunken streaks on stem or leaf stalks, and sunken pits on fruit .. .. **Streak.**

(8) Shoots tufted and swollen at ends .. .. .. **Blue Top.**

(9) Plants become stunted, the foliage turns yellow, and galls are present on the roots .. .. .. **Eelworm.**

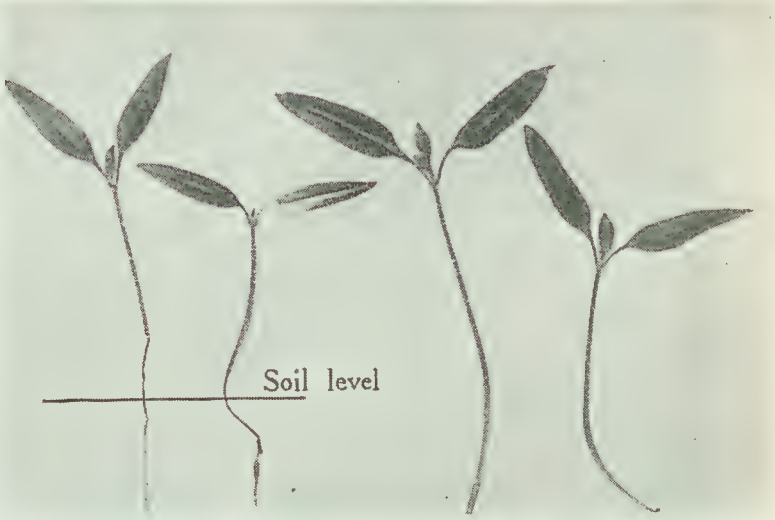
(10) Bronze discoloration on stems and leaves, which slowly shrivel .. .. .. **Mite.**

C.—Diseases affecting leaves.

(1) Small circular spots with grey centres on lower leaves with minute black dots on the grey centres .. .. **Leaf Spot.**

(2) Circular dark spots with concentric rings on leaves and fruit. Defoliation of lower leaves .. .. .. **Early Blight.**

(3) Dark-brown or black blotches on the sides and tips of leaves and on fruit ..	Late Blight.
(4) Pale, greyish mould on under surface of leaves, changing in colour to purple. Affected leaves turn yellow and finally orange ..	Leaf Mould.
(5) Leaflets on one side of leaf are brown and shrivelled, while others on the same leaf are green	Bacterial Canker.



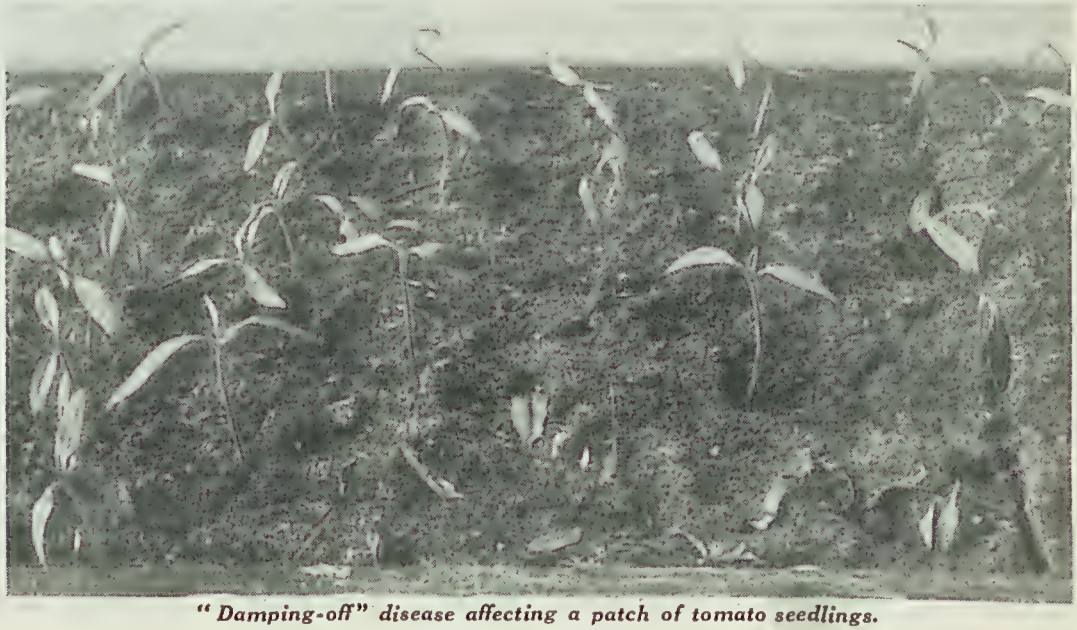
Tomato seedlings attacked by the "damping-off" fungus, showing constriction of the stem at ground level. The two seedlings at the right are healthy.

D.—Diseases affecting the fruit.

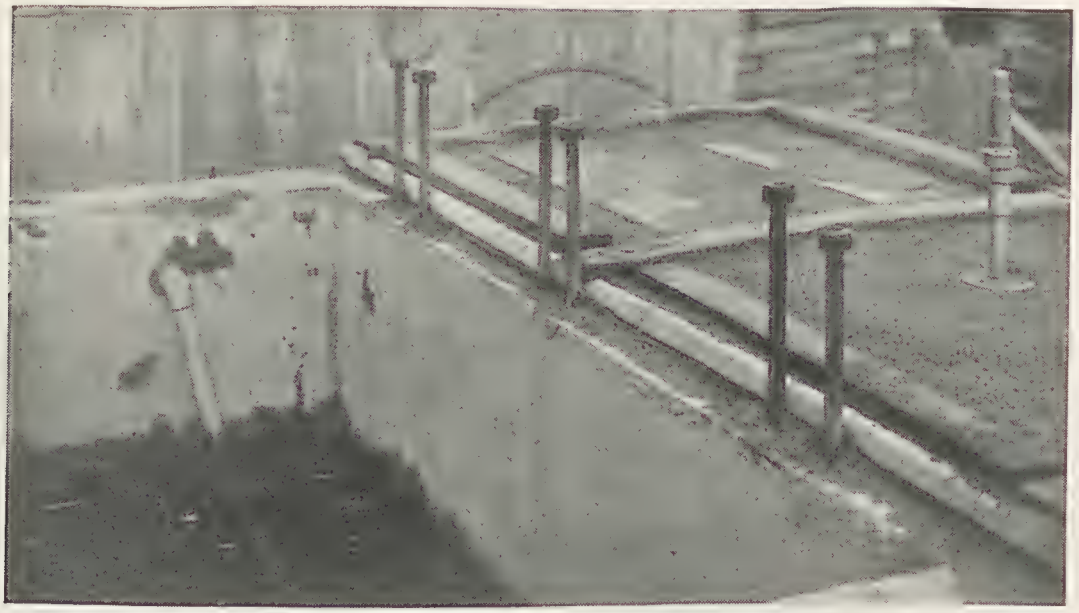
(1) Large, circular, rotten patch at the blossum end of the fruit	Blossom End Rot.
(2) Very small black or dark-brown spots with an unbroken surface	Bacterial Speck.
(3) Soft rot of fruit with grey mould on the surface of the rotted area	Botrytis Rot.
(4) White patch on part of the fruit	Sunscald.

"Damping-off" of Tomato Seedlings.

Practically all growers of tomato seedlings are familar with the damping-off diseases. These are caused by various soil inhabiting parasitic fungi — *Phytophthora cryptogea, Pythium de Baryanum,* and *Rhizoctonia solani.* These diseases are characterized by the toppling over of infected seedlings in patches any time after they have emerged from the soil until their stems have been hardened sufficiently to



"Damping-off" disease affecting a patch of tomato seedlings.



Concrete soil pits suitable for steam sterilization.

resist infection. Infection occurs at soil level; the stems become constricted and collapse. There is, however, a phase of this disease which is not often recognized, and which growers usually attribute to poor germination or low vitality seed. In this phase, the young seedlings are killed before they reach the surface of the soil. It is not uncommon to find the typical damping-off symptoms complicated by the presence of a root rot disease in which the roots die back from the tips.

Damping-off diseases are favoured by poor aeration, over-crowding of plants, excessive moisture, and high temperatures. As the parasitic fungi responsible for these diseases are soil borne, it is most important that growers should not use the same soil in the seed beds year after year unless it has been efficiently sterilized.

Commercial nurserymen raising tomato seedlings for growers usually maintain large reserves of soil in a heap from which the boxes are filled. This soil will become heavily infested with the damping-off fungi where boxes containing diseased seedlings are tipped out on the soil heap, as is often the case in practice.

For commercial nurserymen raising large numbers of tomato seedling plants for growers, it is most important that an effective steam sterilizer should be installed and that all soil used, not only for the sowing of the seed but also for the pricking out of seedlings, should be thoroughly sterilized, and that new boxes only should be used.

Steam sterilization is effected by continually passing large quantities of steam at high pressure (60 lb. to the sq. inch) into the soil until the soil temperature is about 210°F. The treatment should then be continued for 1 to 1½ hours. This treatment effects the eradication of the harmful soil organisms and will completely control damping-off diseases. It is important that the sterilized soil should be aerated for approximately three weeks before it is used.

For the sterilization of old boxes the formalin method is employed. One gallon of commercial formalin (40 per cent. formaldehyde) is diluted with 49 gallons of water and the boxes are thoroughly saturated with this solution, stacked in a heap, and covered with sacking or a tarpaulin for 48 hours.

Where steam sterilization facilities are not available for commercial nurserymen, formalin sterilization may be employed. Soil may be heaped in layers of 1 foot and saturated with a 2 per cent. solution, i.e., 1 gallon of commercial formalin to 49 gallons of water. A further layer of the same thickness may then be added and saturated as before. One ton of soil requires about 40 gallons of diluted formalin. After treatment, the soil should be covered with a tarpaulin or sacking for 48

hours, after which time the covering should be removed, and the soil spread out into a thin layer until all smell of the formalin has gone.

For the sterilization of tomato seed beds on the farm this method may also be used. After watering with the formalin solution, the seed beds should be covered with sacking as before for two days, after which time the covering should be removed, the treated soil forked and aerated for ten days to two weeks before sowing.

Tomato seedlings raised in sterilized and non-sterilized soil. Note how the seedlings have been killed before reaching the surface in the unsterilized soil. The soil in both sections of the box originally was taken from the same soil heap and seed was sown at the same rate.

Where the damping-off disease is due to *Phytophthora* or *Pythium* spp. alone, it can be controlled by the use of Cheshunt compound. This compound was developed (for the control of damping-off disease) at the Cheshunt Research Station, England, and is now widely used throughout the world. It has the great advantage over most other disinfectants that it may be used for watering around the base of the growing plants without injuring them. This compound is prepared by mixing fresh powdered copper sulphate and ammonium carbonate (which must be fresh) in the proportion of 2 oz. of the former to 11 oz. of the latter. This dry mixture is then stored in a corked non-metallic jar for at least 24 hours and is prepared for use by dissolving 1 oz. of the dry mixture in a little warm water and adding to 2 gallons of water. It should not be put into vessels of iron, tin, or zinc, as it corrodes them and loses its strength. It may be watered on to young plants without injuring those that are healthy and will protect healthy plants from infection. It should be thoroughly applied so that the soil is saturated.

Where the damping-off problem is complicated by the presence of Rhizoctonia and other root rot fungi, as is usually the case under Victorian conditions, it has been found that steam or formalin sterilization of the soil is the only effective method of handling the position. Where Cheshunt compound is used in such cases, the collar rot trouble is controlled but not the root rot.

"Black Dot" Root Disease.

"Black Dot" root disease has at times caused serious damage to tomato plants grown in northern Victoria. The main effect of this disease is the premature death of the plant usually by the end of February. This is a serious matter in a district where the sale of the late crops to the pulping factories is an important adjunct to the earlier market trade.

The fungus causing this disease (*Colletotrichum atramentarium*) may infect the plant

Tomato plant roots affected with root rot caused by the "black dot" fungus.
[After *Samuel.*

at a very early stage of growth and, although the parasite may be present in the roots, a well-grown plant may show no signs of the disease and set six trusses of fruit. By this time the vigour of the plant is much reduced

"Black dot" root disease. The soil in the three pots on the left was inoculated with the "black dot" fungus. The control plants are on the right.

and the disease asserts itself. The affected plants are stunted and the lower leaves turn yellow and fall. There is a gradual failing of the plants and they soon die.

The root system and the base of the stem of the affected plants are shrivelled, some of the roots are devoid of cortical tissue and show the central wood core covered with minute black dots. These small black dots are the resting bodies of the causal fungus, and it is by means of these bodies that the fungus is carried over from year to year in the soil. These bodies may also be found within the hollow stems of affected plants. Conditions under which the soil becomes too dry and is then heavily watered appear to favour this disease.

Control.

For the control of "black dot" disease it is important that the seedlings should be raised in sterilized soil and that healthy seedlings only should be planted out on land which has not grown tomatoes for several years. Care should be taken to ensure that the moisture content of the soil is maintained without excessive variations.

Diseased plants should be carefully removed and burnt, and they should on no account be ploughed into the soil. Potatoes should not be included in the rotation as they also are attacked by this fungus.

WILT DISEASES.

Verticillium Wilt.

Verticillium Wilt, which is caused by the soil fungus *Verticillium albo-atrum,* occurs in the cooler areas of this State. The affected plants at first show a tendency to wilt during the warmer and lighter times of the day and they usually recover at night and wilt again next day. As the disease advances, the lower leaves turn yellow and the affected plants die. If the plants are split open a brown discoloration may be observed extending to the top of the plant. The wilting of the foliage is largely due to poison manufactured by the fungus within the plant.

Fusarium Wilt.

The wilt caused by the soil fungus *Fusarium lycopersici* is very similar in symptom expression to verticillium wilt. Tomato plants are liable to attack by the fungus in all stages of growth. The first sign of the disease is a slight wilting and drooping of the lower leaves, finally the entire plant wilts and dies. The fungus enters the roots and grows in the water and food-conducting channels of the infected plants. If the stem of the infected plant is split, a brown discoloration may be observed extending

Tomato plant affected with fusarium wilt.

up the stem of the plant. The fusarium wilt occurs during the hot summer months, whereas the verticillium wilt is a low temperature disease.

Control.

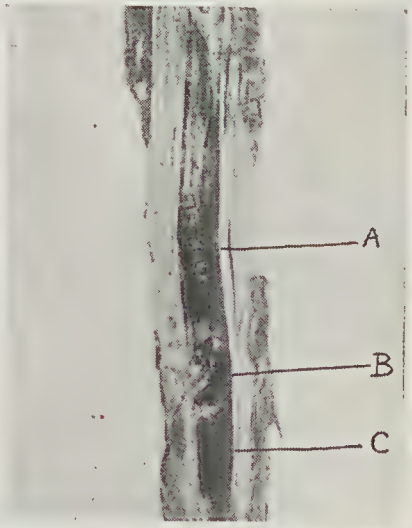
As the organisms causing both of these diseases are soil borne, it is important that diseased plants should be collected and burnt. They should on no account be ploughed into the soil. Tomato lands so affected should be given over to the growing of some other crop for a number of years.

In recent years strains of tomatoes resistant to fusarium wilt have been developed under American conditions. Several of these varieties were imported some years ago, but they were unsuitable commercially for local requirements.

To safeguard against these diseases it is important to raise healthy seedling plants in sterilized soil and to plant these on new ground or ground that has not grown tomatoes for some years.

Sclerotinia Stem Rot.

Sclerotinia Stem Rot, which is caused by the fungus Sclerotinia, occurs in some of our southern tomato growing districts. The plant is usually attacked at its collar, where dark-brown areas are produced. The white strands of the fungus cover the diseased area and also fill the stem cavity. Black sclerotes or the resting bodies of the fungus are produced, usually in the stem cavity, and it is by means of these bodies that the fungus carries over from season to season. Affected plants may



Tomato stem showing the resting bodies (A, B, C) of sclerotinia stem rot fungus in the pith.
[After *Dickson.*

show wilting during the day and recovery at night, but usually the plants will suddenly wilt and die.

Diseased plants should be removed and destroyed by fire. They should not be ploughed in. Crop rotation is necessary for the control of the disease. Spraying with Bordeaux mixture 4.4.50, or dusting with copper dust around the soil at the base of the plant will assist in preventing the spread of infection.

VIRUS DISEASES.

Spotted Wilt.

Spotted Wilt disease of tomatoes was first encountered in Victoria in 1915. Since that time it has become widespread throughout the tomato growing districts of the State, causing, in certain years, losses of fully 50 per cent. or more of the plants. It varies in its severity from year to year in various districts, but it very frequently causes severe damage to tomato plants growing in the metropolitan area.

Plants may be infected at any stage in their growth, the outstanding manifestations of the disease being a bronzing of the young foliage.

Tomato plant affected with spotted wilt.

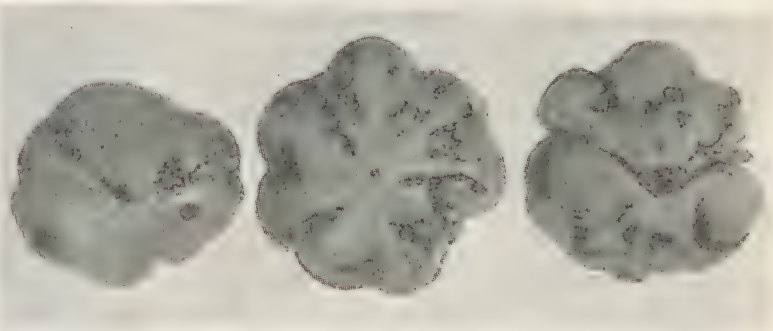
Bronze markings of spotted wilt on the upper surface of a tomato leaf.
[After *Samuel.*

The topmost leaves tend to curve downwards and inwards giving the plant a wilted appearance. Growth becomes arrested at this stage and the plants remain dwarfed but usually do not die. Any fruit that may be produced on affected plants occasionally ripens normally, but often it shows irregular red and yellow blotches.

Spotted wilt is a virus disease, and the particular virus or infective principle which causes it is conveyed from plant to plant by means of a species of thrips. If, in the larval stage, this insect feeds on a tomato or other plant containing the virus and afterwards feeds on a healthy plant of a susceptible kind, the latter will become infected. As the spotted wilt virus is able to infect a considerable number of ornamental plants and weeds, it is these plants, particularly the susceptible biennial plants, which act as reservoirs from which the thrips may transmit virus to tomato plants in the following season.

There is no direct method of controlling spotted wilt under field conditions. In the light of present knowledge of this disease, consideration should be given to the following points.

As spotted wilt virus is known to infect certain weeds which occur frequently in the tomato growing areas, such as black nightshade and plantain, it is important that seedlings should be raised in sterilized soil so that the seed frames are free from weeds, also weeds should not be permitted to grow near the frames. Tomato plants in the field should be well-cultivated to keep down weed growth. It is advisable also to pull out infected plants in the early stages as these plants never do any good and merely serve as sources of infection for healthy plants.



Tomato fruits affected with streak disease showing brownish sunken areas.

[After *Samuel.*

Under conditions favorable for the spread of the disease it is, however, not possible to prevent spotted wilt from spreading by the pulling out of these infected plants.

All efforts to control thrips under field conditions by means of nicotine dusts have not affected the incidence of spotted wilt.

Mosaic.

Tomato plants affected with the mosaic virus show an indefinite mottling of the leaves and very often the leaves are puckered, distorted and rolled. In some instances a "fern leaf" symptom is produced owing to the non-development of the leaf blade. Generally the yield of fruit is considerably reduced on infected plants. Mosaic is due to another virus and is extremely infectious. It may be transmitted by the pruning knife or merely by handling diseased and then healthy plants. Aphis after sucking at diseased plants may also transmit the virus to healthy plants.

Mosaic disease of tomato showing rolling of the leaflets and tendency towards thready leaflets.

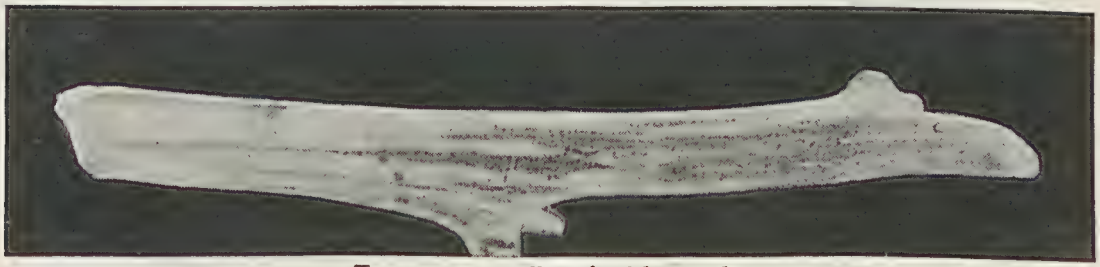
[After *Samuel.*

For the control of this disease infected plants should be removed and burnt in order to limit its spread. Care should be taken not to prune diseased plants and then proceed to prune healthy ones. Aphis should be controlled by the application of nicotine dusts.

Streak.

Streak disease, which has been observed only in glasshouse tomatoes in Victoria is caused by a virus and is characterized by black streaks running up the stem of the plant, irregular black lines on the young leaves and sunken areas on the fruit. The virus causing this trouble may be carried from plant to plant on the fingers or by aphis.

It is advisable to remove and burn infected plants and also to dust with nicotine dusts for the control of aphis.



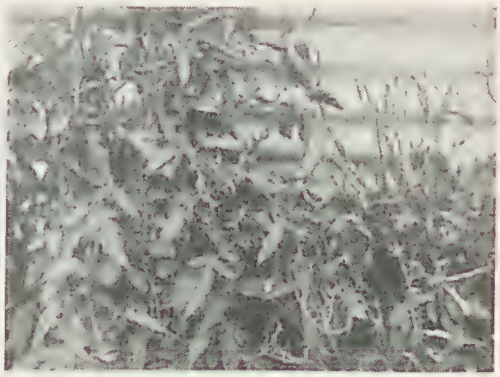
Tomato stem affected with streak.

[After *Bewley.*

Blue Top, Rosette or Big Bud.

Blue Top of tomatoes, which is known also as Rosette or Big Bud, is a virus disease which occurs in the northern tomato-growing areas of this State. It is recognized by the characteristic rosette appearance. Shoots do not develop normally and excessive numbers of side shoots are produced at the tips of the branches with small undeveloped leaves. Fruit bunches are stiff and swollen and if fruit is developed it is tough and woody. Only scattered plants are affected.

Blue top can be transmitted experimentally by the grafting of a diseased to a healthy plant. In the field it is no doubt spread by some sucking insect which at present is not known. Growers are advised to remove and burn infected plants.



Showing a tomato plant (right) affected with blue top.

Tomato plant affected with blue top.

Root Knot.

Root Knot disease caused by the eelworm *Heterodera marioni* has been recorded for this State but is of minor importance. Affected plants become stunted, the foliage turns yellow and galls are formed on the root. These minute worms, less than one seventy-fifth of an inch in length, penetrate the roots and so irritate the tissue that knots or swellings are produced and this is accompanied by lack of fibrous root development. After fertilization, the female worms swell rapidly until they become minute pear-shaped bodies full of eggs. When the young worms hatch out, they escape into the soil from the root where they may be carried in water for some distance and later penetrate fresh young roots.

Brown Surface Mites.

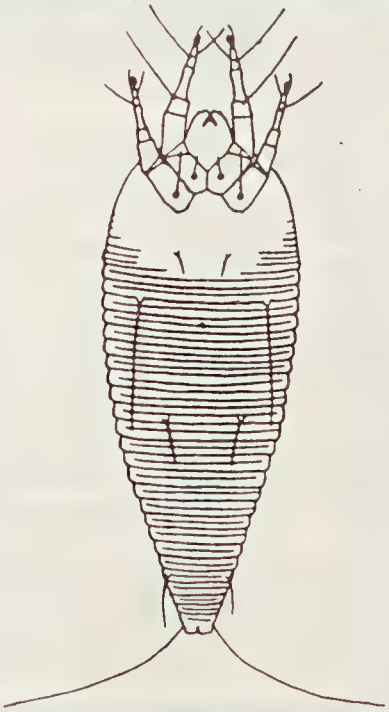
Tomato plants affected with the Brown Surface Mite (*Phyllocoptes lycopersici*) show a rusty-brown discolouration of the stems and

Roots of a tomato plant showing swellings caused by eelworm.
[After *Samuel.*

leaves, due to the feeding of the mites on the surface. Finally the whole plant may become shrivelled.

The best method of control for this mite is to dust the affected plants with a suitable sulphur dust. Care should also be exercised against spreading the trouble from affected plants to healthy ones by pruning or rubbing against diseased leaves before they have been dusted with sulphur. Nicotine dust is also effective.

As this disease is usually confined to tomatoes growing in glasshouses, the trouble may be controlled by pulling out and burning diseased



The brown surface mite (highly magnified).
[After *Samuel.*

plants and thoroughly sterilizing the soil with steam. Oversea workers report that the chemical chloropicrin when injected into the soil has given satisfactory control.

Septoria Leaf Spot.

Leaf Spot of tomatoes caused by the fungus *Septoria lycopersici* has at times caused severe damage to tomato crops in this State. It is recognized by the presence on the leaves of small dark circular spots which have grey centres and dark coloured margins. Not infrequently the spots unite and the leaf shrivels and dies. The disease works upwards affecting

Tomato plant showing injury caused by the brown surface mite.
[After *Magee* and *Morgan.*

the entire foliage with the exception of that at the tips of the stems, leaving fruit and stems bare. Such fruit is usually affected with sunscald.

In the centre of a leafspot small black specks will be seen. These are the fruiting bodies of the fungus from which a yellowish, mucilaginous mass containing the spores of the fungus is produced during periods of wet weather.

Septoria leaf spot.

These spores are splashed by rain on to healthy plants and so the disease is spread. This fungus overwinters in the debris from diseased tomato plants, from which spores are produced in the following spring.

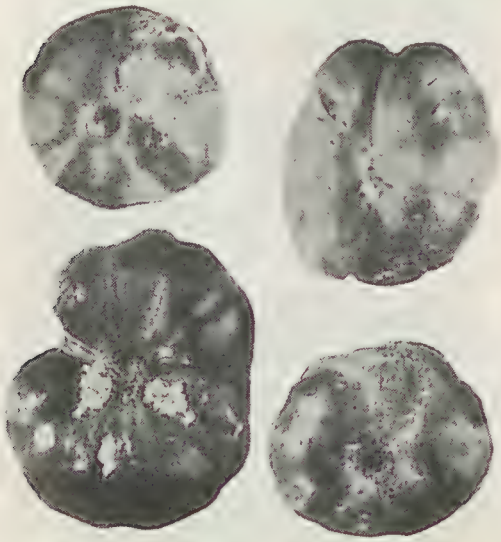
For the control of leaf spot it is important that diseased plants be raked into piles and burnt. Seedlings should be raised in sterilized soil and should be protected by two applications of a suitable copper dust (containing 7 per cent. copper) while in the seed bed. When the plants are established in the field, periodic dusting with a similar copper dust should be carried out. In the application of the dust special care should be taken to cover both the lower and upper leaf surfaces.

Finally, care should be taken in walking through infected tomato fields during wet weather as the mucilage containing the spores is easily carried on hands, clothes and tools.

Tomato leaves affected with target spot or early blight. [After *Samuel.*

Target Spot (Early Blight).

Target Spot, or Early Blight, may cause serious damage to tomato plants in all stages of growth. It is characterized by the presence on the leaves of dark-brown or black circular or irregular spots which often show concentric rings or ridges, hence the name Target Spot. These spots are at first small but under favorable conditions they increase rapidly and run together. The lower leaves are the first to be affected. These turn yellow, wilt and die. The disease may affect not only the leaves but also the leaf stalk, stem and fruit. The infected fruit develops sunken areas on which a black mould appears and the fruit decays.



Tomato fruits affected with late blight.

The fungus causing this disease (*Macrosporium solani*) is spread by means of spores carried in air currents, produced on the diseased spots and it overwinters on the debris of diseased plants. Plants which are not in full vigour from various causes are more liable to infection. Moist conditions with fairly high temperatures favour the development of the disease.

As the presence of target spot indicates lack of vigour in the plants attacked, attention should be given to cultivation and manuring.

Seedling plants should be protected by two applications of a suitable copper dust (containing 7 per cent. copper) while in the seed bed. When the plants are established in the field, periodic dustings with a similar copper dust should be applied.

Late Blight.

In certain seasons where heavy rains fall in January, February and March associated with cloudy, muggy weather, late blight fungus (*Phytophthora infestans*) may develop on tomatoes. Both the fruit and leaves may be attacked, but the fruit generally is more commonly attacked than the leaves. On the fruit slightly sunken, irregular areas may be seen, whereas on the leaves dark-brown or black blotches appear, generally on the tips and sides. On the under surface of diseased leaves a

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Tomato leaves affected with late blight.
[After *Smith.*

greyish-white mould will be seen if the weather is warm and moist. Dark streaks will show on the stems and leaf stalks until the whole plant is black and dead.

Immediately the disease appears plants should be dusted with a suitable copper dust. Where copper dusts are applied regularly in a routine manner for the control of early blight and leaf spot, the onset of late blight will be prevented.

Leaf Mould.

Tomato Leaf Mould caused by the fungus *Cladosporium fulvum* was first recorded as occurring in Victoria in the spring of 1934. It is mainly confined to tomatoes growing under greenhouse conditions, but has been observed in field tomatoes growing adjacent to a glasshouse of affected plants.

Small white downy patches appear on the under sides of the leaves of infected tomato plants, and these patches are accompanied by a yellowing of the tissue on the corresponding parts of the upper leaf surfaces. The colour of the fungal growth changes, as the disease progresses, from a pale-buff colour to tawny olive and is surrounded by the advancing white margin. Such leaves are soon killed and as they dry out the downy patches become purple and the upper leaf surface changes from yellow to reddish brown when the leaf is dead. The fungus may also occur on the stems.

Infection of both the calyx and the ovary of the flowers has been noted and the calyx usually dies from the top towards the base. In slight attacks the old leaves only are affected and little injury results. However, in severe cases the reduction of the leaf area so weakens the plant that fruit production ceases and the plant dies prematurely. The spores of leaf mould are air borne, and oversea workers have shown that infection readily occurs under conditions of dull light, humid atmosphere and temperatures between 68° F. and 77° F. The fungus overwinters by means of these spores which remain viable in a dry condition for twelve months.

Control.

For the control of leaf mould, the following measures may be taken:—

1. Where houses contained infected plants during the previous season, they should be fumigated, prior to planting, with sulphur dioxide, burning sulphur at the rate of 1 lb. of sulphur to 1,000 cubic feet space.

2. The provision of a dry atmosphere for the growing of plants by means of adequate ventilation, efficient air circulation and care of watering is a most important condition to secure, without which spraying measures are of little avail.

3. There is a great difference of opinion as to the value which sprays afford in protecting plants against leaf mould. Sulphur in various forms is reported as being more effective than copper compounds. Overseas workers have reported successful results in the control of the disease from spraying with salicylanilide used in conjunction with new wetting agents of the sulphonated oil type. These spray materials are now available on the local market.

Control is reported to be most successful where the treatment is commenced when the plants are small and continued at intervals of two weeks.

Leaf symptoms of tomato leaf mould.

Bacterial Canker.

Bacterial canker which is caused by the bacterium *Phytomonas michiganensis* causes serious damage in this State. The disease is most easily recognized by its effect on the leaves of the plants, the damage being the result of the invasion of the water conducting vessels by bacteria.

The first symptoms usually appear on the lower leaves, the disease progressing upwards causing browning and dying of the foliage. It is very common to find only one side of the plant attacked, and usually the leaflets on one side of a leaf are brown and shrivelled, while others on the same leaf appear normal. Infected shoots are usually stunted, and if an infected leaf, stalk or stem be cut across, a yellowish discolouration can be seen just inside the woody cylinder. Further symptoms of this disease consist of the splitting of the stem and the leaf stalk to form cankers, and also spotting of the fruit.

The causal bacterium is transmitted within and on the surface of the seed, and it is by this means that the disease is brought into new areas. Seed should never be saved from fields known to be infected with bacterial canker. It should be saved only from a crop of healthy plants, and as a further precaution it should be extracted by fermentation with the pulp without water for at least two days. Before sowing seed of unknown origin, it should be treated with mercuric chloride (corrosive sublimate) at the rate of ¼ oz. in 5 gallons of water. Treat for five minutes then wash in water for ten to fifteen minutes.

Bacterial canker—Tomato leaf showing infection on one side of leaf only.

Once bacterial canker makes its appearance the soil becomes infected and serves as an additional means for the carry-over of the disease from season to season. If the soil in the seed bed is not known to be free from the disease it should be sterilized.

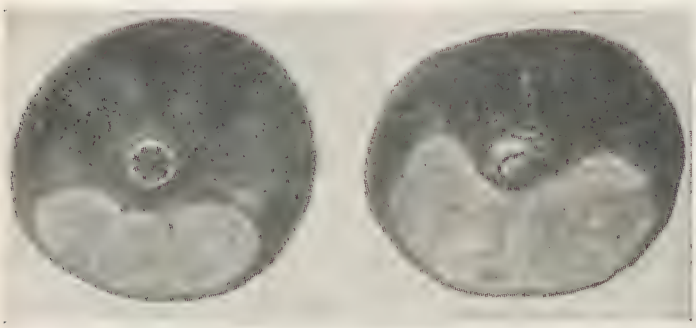
Destruction of diseased plant material, together with rotation of crops, will help to eliminate soil infection. Tomatoes should not be planted in infected soil until it has been in other crops for at least two years.

Tomato affected with blossom end rot.

Blossom End Rot.

The condition known as Blossom End Rot, which is very common on tomatoes grown in the northern districts of Victoria, is a non-parasitic disease caused by extreme fluctuations in the water supply of the growing plant.

The first sign of the disease is seen as a small water-soaked patch around or near the blossom end of the fruit. The spot enlarges and soon becomes sunken, changing from a putty colour to dark brown. The disease is



Tomato fruits affected with sunburn. [After *Samuel.*

not associated with an organism. It is due to the plant being unable to obtain an adequate supply of water for its development. The plants need not droop from want of water, but the water lost from the leaves may be more than the roots can supply and to meet the position, water is withdrawn from the fruit.

This trouble is usually prevalent when the rapidly growing plants have been subject to heavy rains or a heavy irrigation, following a spell of dry conditions. Any practice which tends to conserve soil moisture such as careful irrigation, cultivation and mulching will assist in controlling the condition.

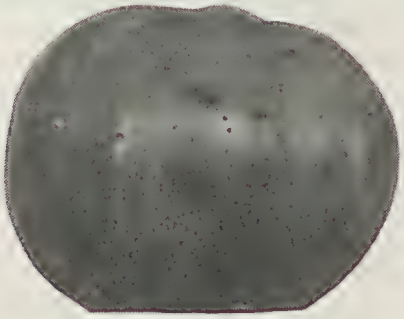
Sun Scald.

Sun scald of tomatoes may be recognized by the whitish leathery patch, sometimes wrinkled, which develops on the side of the fruit which is exposed to strong sunlight. The killing is due to the combined effect of heat and light. Precautions against the development of leaf diseases which produce defoliation will reduce losses from sunburn.

Bacterial Speck.

Tomato "speck" disease caused by the organism *Bacterium punctilans* has recently been observed in this State. Very minute black specks occur on the fruit and affect its appearance on the market.

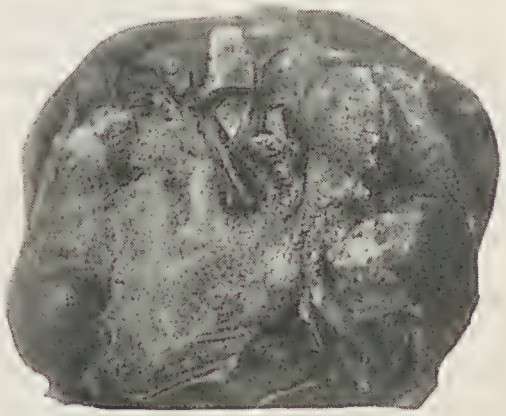
Seed sterilization and crop rotation as applied for bacterial canker should also keep the trouble in check.



Tomato fruit affected with bacterial speck (artifical inoculation).

Botrytis Rot.

Botrytis rot, which is confined to the tomatoes growing under glass, may cause a stem and fruit rot. It is characterized by a grey, fluffy growth of fungal strands and spores. Infection demands warm, moist conditions and a suitable wound. The presence of this disease is always indicative of excessive humidity and steps should be taken to reduce this by adequate ventilation and air movement.



Botrytis rot of tomato.

References.

Adam, D. B.—Tomato Diseases and Their Control. Bulletin 26, New Series, Dept. of Agriculture, Victoria, 1927.

Bewley, W. F.—Tomatoes: Cultivation, Diseases and Pests. Ministry of Agriculture and Fisheries, Bulletin 77, 1934.

Brittlebank, C. C.—Tomato Diseases. Bulletin 26, Dept. of Agriculture, Victoria, 1924.

Fish, S., and Pugsley, A. T.—Bacterial Canker of Tomatoes. *Journal of Agriculture, Victoria*, Vol. 34, 520, 1936.

Fish, S.—Target Spot of Tomato Seedlings. *Journal of Agriculture, Victoria*, Vol. 29, 132, 1931.

Fish, S., and Pugsley, A. T.—Tomato Leaf Mould. *Journal of Agriculture, Victoria*, Vol. 33, 188, 1935.

Kadow, K. J., and Shropshire, L. H.—Tomato Diseases and Insect Pests. University of Illinois, Agr. Exp. Station, Circular 428.

Samuel, G.—Tomato Diseases in South Australia, and How to Control Them. (Reprinted from *Journal of Agriculture, South Australia*, Vol. 34, 1931.)

Butter-fat Losses in Churning

By W. J. Wiley, D.Sc., dairy research officer of the Council for Scientific and Industrial Research

Dr. Wiley, formerly of New Zealand, has been appointed to the staff of the Council for Scientific and Industrial Research, which organization has entered into an arrangement with the Department of Agriculture for co-operative research work into problems associated with the dairying industry. This research will be conducted at the School of Dairy Technology established by the Department of Agriculture at Werribee.

THE butter-fat retained in the butter-milk after churning can be a source of loss, the importance of which is not always realized by the factory manager. The loss is rarely below 1 per cent. of the fat received and can approach double that proportion if care is not taken in the manufacture. One per cent. loss in a factory making 3,000 tons of butter per annum with butter selling at 110 shillings per cwt. would represent £3,300. A saving of even a tenth of a per cent. in the fat losses would be well worth some effort on the part of the buttermaker.

The first point in an attempt to reduce the losses is to make a reliable estimation of the quantity of fat lost. In order to do this both the proportion of fat in the butter-milk and the quantity of butter-milk must be determined. The determination of only the proportion of fat in the butter-milk does not give sufficient information and unless the quantity of butter-milk is taken into account, quite erroneous conclusions may be drawn.

Thus a typical fat test of the butter-milk obtained by churning a ripened cream containing 20 per cent. fat, such as is churned in some European countries would be 0.4 per cent., whereas a fat test of the butter-milk from a neutralized cream containing 40 per cent. fat might be 0.8 per cent. The former churning might at first sight appear to be the more efficient. When the fat lost is expressed as a percentage of the fat churned however, the loss with the 20 per cent. cream would be 1.5 per cent. and with the 40 per cent. cream would be 1.0 per cent., so that the latter is really the more efficient churning. The reason is that the greater quantity of butter-milk from the 20 per cent. cream, although containing a smaller percentage of fat, carries away more of the original fat than does the smaller quantity of butter-milk from the 40 per cent. cream, although this butter-milk contains a larger percentage of fat.

The percentage of fat in the butter-milk can be readily determined by suitable methods but generally it is impracticable to weigh the butter-milk, and recourse must be made to indirect methods of calculating the quantity of butter-milk. These are based on the composition of the cream and butter. Part 1 of this article will describe methods of estimating the fat loss as a percentage of the fat churned. The methods have been proved to be accurate by checking against the loss found by actually weighing the butter-milk. Part 2 will describe the important factors influencing the fat losses.

Estimation of Proportion of Fat Churned which is Lost in Butter-milk.

Analysis of Butter-milk.

The fat in the butter-milk consists principally of the smallest fat droplets which were in the cream and this causes some difficulty in the estimation of the proportion of fat present. The Babcock test if applied in the way used for milk or cream gives erroneous results which are too low because the small fat droplets do not rise to the neck of the bottle. Incidentally the Babcock test is not applicable to separated milk for the same reason. Where laboratory facilities are available the Roese-Gottlieb method (or one based on similar principles, such as the Majonnier) is the most suitable test. Laboratory workers will know the details of such tests and they need not be described here.

The Babcock method can, however, be modified so as to yield reasonably accurate results with butter-milk and skim milk and a modified form known as the butyl alcohol method is

quite suitable for use in any factory. The details of the method are as follows:—

When the butter-milk contains less than 1 per cent. of fat a Babcock skim milk test bottle should be used. This bottle has a narrow neck graduated to read from 0 to 0.5 per cent. of fat and parallel to the neck a wide tube extending nearly to the bottom of the bottle. The wide tube is used for the addition of the sample and re-agents to the bottle. The sample of butter-milk should be strained through cheese cloth before testing.

The general procedure of the test is very similar to that of the Babcock test. The essential difference is that normal butyl alcohol is added to the butter-milk. This addition causes the small fat globules to rise in the neck of the test bottle. Without the addition they do not rise and the results obtained are low.

Two millilitres of normal butyl alcohol are measured into the bottle with a pipette, 8.8 ml. of the butter-milk sample are added and then 7 ml. of sulphuric acid. The bottle is gently shaken with a rotary motion until the curd has dissolved and the contents appear homogenous.

The bottle is centrifuged in the usual way for six minutes. Care must be taken that the correct speed of the centrifuge is maintained. Sufficient hot water (190°F.) is added to fill the bulb of the bottle and the bottle is centrifuged for two minutes. Hot water is again added to bring the fat into the neck of the bottle and the bottle centrifuged for two minutes.

The bottle is then placed in a water bath at 140°F. for two or three minutes before reading the fat column. The reading of the fat column should be taken from the junction of the fat and the acid to the upper edge of the fat meniscus, i.e., the point where the fat surface touches the glass. The reading obtained must be multiplied by two because 8.8 ml. of butter-milk were taken for testing. The determinations should always be made in duplicate.

If the butter-milk contains over 1 per cent. of fat the determination should be made in the usual Babcock milk testing bottle taking 17.6 ml. of butter-milk for the sample. Normal butyl alcohol (4 ml.) is first added to the bottle and the determination then made in the same manner as when testing milk.

Determination of Fat Loss for One Churning.

One method of determining the proportion of the total fat lost in the butter-milk, which is of particular value to the factory manager for checking the efficiency of any individual churning, is based on the composition of the butter granular after the cream has "broken." This method was proposed by E. W. Bird in America. It is assumed that at this stage of the manufacture there is an over-run of 20 per cent. This assumption has been proved to be very close to the truth by many trial churnings both in America and New Zealand. The percentage of fat in the cream (cream test) at churning time must also be known.

The calculation is based on the following considerations:—

The quantity of butter from 100 parts of cream = per cent. fat in cream $\times \frac{120}{100}$

And the quantity of butter-milk from 100 parts of cream = 100 — per cent. fat in cream $\times \frac{120}{100}$

This is true only if breakwater has not been added and it must be particularly noted that if breakwater is used in the churn, allowance must be made for the resultant dilution of the cream.

The quantity of fat in 100 parts of cream = per cent. fat in the cream.

The fat lost in the butter-milk expressed as a percentage of the fat taken for churning

$$= \frac{\text{(Butter-milk from 100 parts of cream)}}{\text{(Fat in 100 parts of cream)}} \times \frac{\text{Fat test of Butter-milk}}{100} \times 100$$

$$= \frac{100-(1.2 \text{ Fat test of cream})}{\text{Fat test of cream}} \times \text{butter-milk test.}$$

Thus the loss of fat can be expressed as a percentage of the total fat taken without the necessity of knowing the actual weights of cream or butter-milk.

The calculation is readily made with the aid of figures given in Table 1 which shows the values of the factor

$$\frac{100 - 1.2 \text{ Fat Test of Cream}}{\text{Fat test of Cream}}$$ for values of 23 to 44 for the percentage of fat in the cream at churning.

TABLE 1.—VALUES OF $\frac{100-1.2 \text{ FAT TEST OF CREAM}}{\text{FAT TEST OF CREAM.}}$

Fat Test of Cream.	*Factor.*	*Fat Test of Cream.*	*Factor.*
23.0	3.15	34.0	1.74
23.5	3.05	34.5	1.70
24.0	2.97	35.0	1.66
24.5	2.88	35.5	1.62
25.0	2.80	36.0	1.58
25.5	2.72	36.5	1.54
26.0	2.65	37.0	1.50
26.5	2.57	37.5	1.47
27.0	2.50	38.0	1.43
27.5	2.44	38.5	1.40
28.0	2.37	39.0	1.36
28.5	2.30	39.5	1.33
29.0	2.25	40.0	1.30
29.5	2.19	40.5	1.27
30.0	2.13	41.0	1.24
30.5	2.08	41.5	1.21
31.0	2.03	42.0	1.18
31.5	1.97	42.5	1.15
32.0	1.92	43.0	1.13
32.5	1.88	43.5	1.10
33.0	1.83	44.0	1.07
33.5	1.78	44.5	1.05

For example, if a cream containing 38 per cent. of fat gave a butter-milk containing 0.95 per cent. of fat, the fat lost in the butter-milk would be 0.95 x 1.43 = 1.36 per cent. of the fat churned.

If the cream contained 30 per cent. of fat and the resultant butter-milk 0.95 per cent. of fat, the loss would be 0.95 x 2.13 = 2.02 per cent.

These examples emphasize how misleading the results of the fat test of the butter-milk only may be. In both cases, this was 0.95 per cent., but whereas in the case of the 38 per cent. cream it represented a loss of 1.36 per cent. of the fat, in the case of the 30 per cent. cream it represented a loss of 2.02 per cent.

This method is very convenient for checking the efficiency of any particular churning if breakwater is not used for the churning. Summarized, the procedure is:—

1. Determine the per cent. of fat in the cream at the time of churning.
2. Determine the per cent. of fat in the butter-milk, making sure that the butter-milk is not diluted with breakwater or wash water.
3. Multiply the per cent. of fat in the butter-milk by the factor corresponding to the per cent. of fat in the cream. The result gives the percentage of fat entering the churn which is lost in the butter-milk.

If a known proportion of breakwater has been added to the cream the method may be applied by calculating the fat test of the cream after it is diluted with the breakwater.

Fat test of diluted cream

$$= \text{fat test of cream placed in churn} \times \frac{100}{100 + \text{per cent. breakwater added.}}$$

The calculated fat test of the diluted cream must then be used for estimating the proportion of fat lost in the butter-milk.

DETERMINATION OF FAT LOSS OVER A DAY'S CHURNING.

Another method of calculating the loss is of particular value when it is desired to check the churning efficiency over a full day's manufacture. This method was developed by W. H. Udy, in New Zealand. It is applicable in those cases where a central laboratory checks the manufacture. This method makes allowance for any water added to the cream during manufacture. It is based on the analysis of a composite sample of the day's butter-milk and the percentage of fat in the day's cream as received at the factory. The latter figure can be obtained from the factory records of the fat tests of the suppliers or analysis of the cream in the receiving vats before the can rinsings are added. It can usually be assumed to be fairly constant over a period of about a month.

The composite sample of butter-milk may be obtained by taking a dipper of butter-milk from each churning and mixing in a can. The method of calculation is the same in principle as that of the previously described method, but allowance is made for the dilution of the cream during processing. The dilution is caused by rinsings, water added during neutralization, some methods of pasteurization, and any breakwater which may be added.

Although the calculation may at first sight appear rather complicated, it is easily made in practice.

The percentage fat loss=

$$\frac{\text{Weight of unwatered butter-milk from 100 parts of cream} \times \text{Fat test of unwatered butter-milk}}{\text{Fat test of cream as received.}}$$

The weight of unwatered butter-milk from 100 parts of cream can be calculated, as follows:—The over-run is assumed to be 20 per cent. so that the 100 parts of cream give $\frac{120}{100} \times$ fat test of cream, parts of butter.

Numerous analyses have shown that butter made by the methods used in Australia and New Zealand contains on the average 10 per cent. of unwatered butter-milk, i.e., cream serum. The quantity of unwatered butter-milk in the butter will therefore be $\frac{1}{10} \times \frac{120}{100} \times$ fat test of cream, i.e., 0.12 x fat test of cream. The quantity of unwatered butter-milk not retained by the butter, i.e., the butter-milk run away, is 100 — (1.12 x fat test of cream).

The sample of butter-milk which is analysed is the watered butter-milk, and it is necessary to calculate the percentage of fat in the unwatered butter-milk from the analysis. The percentage of solids-not-fat is estimated in the butter-milk sample, and it is assumed that the unwatered butter-milk contained 8.8 per cent. solids-not-fat. The lowering in the proportion of solids-not-fat is proportional to the added water in the butter-milk.

Hence, percentage of fat in unwatered milk

$$= \frac{8{\cdot}8}{\text{Solids-not-fat in watered butter-milk}} \times \text{Percentage of fat in watered butter-milk.}$$

The percentage of solids-not-fat in the butter-milk is readily determined by measuring its density with a lactometer. From this figure and the percentage of fat in the butter-milk, the percentage of solids-not-fat can be obtained by the use of Richmond's slide rule or the following formula:—

Percentage solids-not-fat = 0.25 Lactometer reading + 0.2 percentage fat + 0.14.

The formula can be simply expressed thus:— To obtain the percentage of solids-not-fat, add one-quarter the lactometer reading to one-fifth the percentage of fat, and add 0.14.

The calculation is simplified by the use of Table 2, which gives values of the factor:—

$$\frac{\text{Weight of unwatered butter-milk from 100 parts of cream}}{\text{Percentage of fat in cream as received.}}$$

Having determined the percentage of fat in the *unwatered* butter-milk, this is multiplied by the factor corresponding to the percentage of fat in the cream as received, to give the percentage of the fat in this cream which is lost in the butter-milk.

For example, if the cream received at a factory had an average fat percentage of 40 and the butter-milk contained 0.8 per cent. of fat and gave a lactometer reading of 26, the calculations would be made as follows:—

The percentage of solids-not-fat in the butter-milk is $\frac{1}{4}$ (lactometer reading) + $\frac{1}{5}$ (per cent. fat) + 0.14 = 6.50 + 0.16 + 0.14 = 6.80.

(A Richmond slide rule can be used to make this calculation.)

The percentage of fat in the unwatered butter-milk is $\frac{8.8}{6.80} \times 0.8 = 1.03$.

The percentage of fat received which is lost in the butter-milk is 1.38 x 1.03 = 1.42. The factor 1.38 is obtained from Table 2 and corresponds to the 40 per cent. fat in the original cream.

Briefly, the steps in the calculation are as follows:—

1. **Determine the percentage of fat and the lactometer reading of the butter-milk sample.**
2. **Calculate the percentage of solids-not-fat in the butter-milk sample.**
3. **Calculate the percentage of fat in the unwatered butter-milk.**
4. **Multiply the percentage of fat in the unwatered butter-milk by the factor corresponding to the percentage of fat in the cream before processing.** The result gives the percentage of this fat which was lost in the butter-milk.

TABLE 2.—VALUES OF WEIGHT OF UNWATERED BUTTER-MILK FROM 100 PARTS OF CREAM

FAT TEST OF CREAM.			
Fat Test of Cream.	*Factor.*	*Fat Test of Cream.*	*Factor.*
23.0	3.23	34.0	1.82
23.5	3.13	34.5	1.77
24.0	3.05	35.0	1.73
24.5	2.96	35.5	1.69
25.0	2.88	36.0	1.65
25.5	2.80	36.5	1.61
26.0	2.73	37.0	1.58
26.5	2.65	37.5	1.54
27.0	2.58	38.0	1.51
27.5	2.52	38.5	1.47
28.0	2.45	39.0	1.44
28.5	2.39	39.5	1.41
29.0	2.33	40.0	1.38
29.5	2.27	40.5	1.35
30.0	2.21	41.0	1.32
30.5	2.16	41.5	1.29
31.0	2.11	42.0	1.26
31.5	2.05	42.5	1.23
32.0	2.01	43.0	1.20
32.5	1.96	43.5	1.17
33.0	1.91	44.0	1.15
33.5	1.86	44.5	1.13

Factors Influencing Loss of Fat in Churning.

The proportion of the fat churned which is lost in the butter-milk is rarely below 1 per cent. and may be 2 per cent. or even more. A high loss may continue for a considerable time without being suspected. The factory should regularly determine the losses and endeavour to reduce them to the minimum. The manner in which this can be done is a problem for each individual factory. The principal factors governing the efficiency of churning will be discussed here, and the buttermaker whose losses are high may determine which he can modify in order to reduce the losses.*

Some general principles should be kept in mind. The fat in the butter-milk consists of the smallest fat globules in the cream and any treatment which causes a breaking up of the large globules will lead to an increased loss. Agitation of the cream while the fat globules are molten can cause disruption, so should be kept at a minimum. The solidification of the fat after the cream is cooled is a slow process and if sufficient time is not allowed for its completion before churning, the agitation in the churn can break up some of the large globules and result in high losses. The composition of the fat varies throughout the season, and the buttermaker must vary the temperatures of cooling and churning to ensure that the fat will be in the correct state of solidification so that there will be the minimum loss during churning.

Influence of Fat Test of Cream.

It has been definitely established by a large number of experimental churnings that the proportion of fat which is lost in the butter-milk is least if the cream contains from 35 to 40 per cent. of fat. Other things being equal the fat test of the butter-milk from a low test cream will be less than from a high test cream. However, there will be more butter-milk from the low test cream.

When these two factors, fat test and quantity of butter-milk, are taken into account, it has been found that the efficiency of churning is influenced by the fat test of the cream. With low testing cream (below about 35 per cent. fat) the large quantity of butter-milk causes undue losses. With high testing cream (over about 40 per cent.) the smaller quantity of butter-milk has such a high fat test that again undue losses are caused. The fat losses are at a minimum in a cream containing about 37.5 per cent. of fat.

Influence of Acidity and Neutralization.

The churning of ripened cream need not be considered here, as such cream is never churned for the manufacture of butter of good keeping quality. Within the limits of about 0.2 to 0.05 per cent. acidity the losses in a sweet cream or correctly neutralized cream churning are not appreciably affected by the acidity. The neutralizer used can have some influence on the losses. When lime is used the viscosity of the cream is increased, and this leads to less efficient churning and higher fat losses. The soda neutralizers do not increase the viscosity and are preferable.

Influence of Chilling Cream.

The butter-fat of the cream is a mixture of simpler fats, all of which have different melting points. The fat in the cream after pasteurization is all molten and as it cools the different fats solidify and form crystals. The process of crystallization, however, is slow and takes some hours for completion. If there is an undue proportion of liquid fat in the cream at churning time, the churning is inefficient and a high proportion of the fat is lost in the butter-milk. In order to minimize the losses, therefore, the cream must be cooled to a sufficiently low temperature for crystallization of the fat and held at that temperature for a sufficient time for the crystallization to be completed.

The time necessary for crystallization of the fat varies with the season of the year and is at least three hours. The cream should never be churned before holding at the low temperature for at least that period of time, preferably it should be held overnight. If it is necessary to churn without a sufficiently long holding period, the cream must be cooled to a lower temperature than it would be if the correct procedure were adopted. The most desirable temperature to which the cream should be cooled cannot be definitely stated.

The proportion of low melting point fats in the cream is influenced by several factors beyond the buttermaker's control, notably the feed of the cows producing the fat and the stage of the lactation periods of the cows. The cooling and churning temperatures of the cream

* It must be remembered that this discussion is concerned only with the fat losses in the butter-milk. It may sometimes be necessary for the buttermaker, in order to obtain the best possible butter from his cream, to adopt methods which lead to an increased fat loss.

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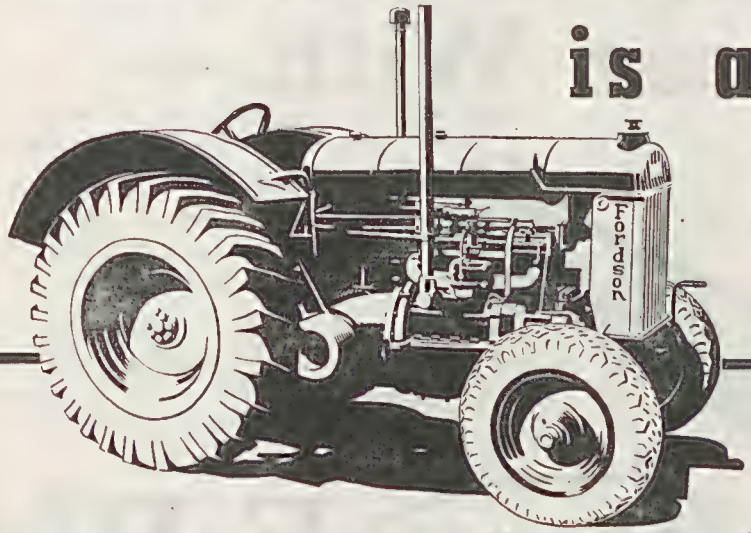

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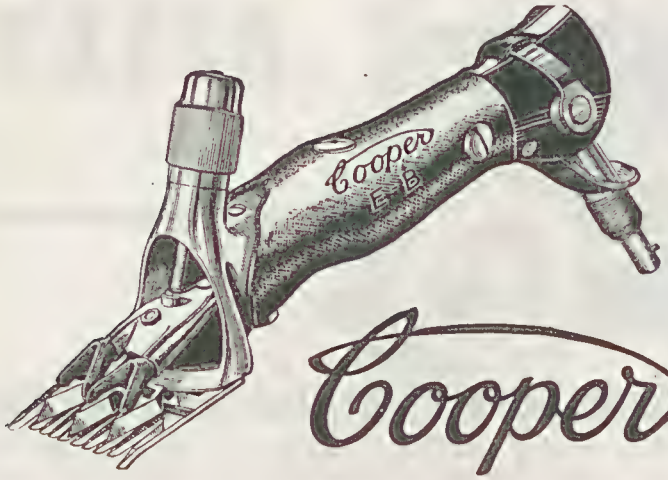

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must be modified in the factory according to the type of fat received so as to produce a butter of the best possible body and texture and to keep the churning losses to a minimum. These temperatures are most readily controlled by the buttermaker and by cautiously experimenting with them and keeping exact records of the butter-milk losses he can often reduce the latter considerably. However, as a general basis for experimenting it can be stated that the cream after pasteurization should be cooled to 40°F., but this figure can be modified according to the type of fat received.

Influence of Churning Temperature.

The correct churning temperature for minimum fat losses depends on the type of butter-fat being received and should be determined by the buttermaker himself. A general rule is that the lower the churning temperature the lower the proportion of fat lost in the butter-milk. However, if the fat has been well chilled after pasteurization it is not necessary to churn at excessively low temperatures. The chilling of the cream will have produced the correct crystallization of the fat and if the churning temperature is not too much higher than this chilling temperature the crystallization will not be altered and fat losses will be kept to a minimum. For instance, with one particular lot of cream which had been cooled and held overnight at 40°F. the fat losses in the butter-milk were the same whether it was churned at 40°, 45° or 50°F.

However, there is a temperature (which depends on the nature of the fat being received) above which there is a rapid melting of portion of the fat and if the churning temperature is higher than this there is a large increase in the fat losses. If this temperature is being exceeded for churning a reduction of a few degrees may considerably reduce the losses.

Influence of Churning Time.

The time taken for churning is not a reliable indication of the efficiency of churning from the point of view of fat losses. The time is largely influenced by the temperature of the cream but *if the fat is in the correct state of crystallization,* as has been explained, the exact temperature of churning is not so important. By keeping a careful control of the fat losses it may sometimes be found possible to churn at a higher temperature than has been used and so reduce the churning time without increasing the losses.*

Whenever modifications are made in chilling and churning temperatures, the influence of these on the body and texture of the butter must not be lost sight of. In general, however, the conditions which produce the best body and texture are conducive to the lowest fat losses in churning.

Influence of Fullness of Churn and Addition of Breakwater.

If the churn is too full, churning is so prolonged that the temperature must be allowed to rise to facilitate the breaking of the cream. This rise in temperature can cause high fat losses in the butter-milk.

Underfilling the churn also leads to inefficient churning and increased fat losses. It is important, therefore, that the churn be filled to its correct rated capacity.

If the churn is correctly filled and churning proceeds normally, the addition of breakwater does not influence the loss of fat in the butter-milk and serves no useful purpose. However, if it is necessary to churn with too little cream in the churn the addition of breakwater (at a temperature about 5°F. below that of the cream) when the cream is on the point of "breaking" will lead to an appreciable reduction of the fat loss.

Influence of Size of Fat Globules.

The size of the fat globules in the cream influences the efficiency of churning. The smaller globules are not collected in the butter and are lost in the butter-milk. The buttermaker cannot control all the factors influencing the size of the globules. For instance, this depends partly on the breed of the cow producing the fat and the stage in the lactation period. However, after the cream is received at the factory, the treatment it receives can have some influence on the size of the globules.

Unnecessary agitation at high temperatures when the fat is molten will lead to breaking up of the larger globules and increased fat losses in the butter-milk. This is the reason why some types of pasteurizers, in which the cream is violently agitated, cause higher losses than pasteurizers which do not agitate the cream so much. The factory layout should be such that all unnecessary agitation and pumping of the hot cream is avoided.

* If the churning time is very abnormal, say less than 20 minutes or more than 80 minutes, incorrect conditions are indicated, such as wrong churning temperature, wrong quantity of cream in the churn or a particularly viscous cream, and these will lead to a poor quality butter and increased losses.

(*Continued on page* 401.

Analyses of Fertilizer Samples

Review of Work During 1938

By W. C. Robertson, Chemist

THE abnormally dry conditions in Victoria during last season made many farmers decide against sowing, with a consequent decline in the quantity of artificial fertilizer used.

In many instances seed sown with fertilizer did not germinate and part of the plant food became a total loss. Where "super." was used, its most valuable part—the water soluble phosphoric acid—in contact with the minerals of the soil, after the first heavy rain, became reverted, and thereby was made of little value for subsequent sowings.

The reversion varies with the soil type, being greater in the clay and clay loams than in the sands and silts. In red and chocolate coloured soils a practically permanent loss in phosphoric acid occurs, but when sown in soils of appreciable lime content, or which have been recently limed, the reverted phosphate formed is not so insoluble and the residual effect of the super. may be noticeable for two or three years afterwards.

Whilst sowings of Superphosphate may result in a direct monetary loss during periods of drought it is not so with sowings of Potash Salts, Blood Manure, Blood and Bone or Bonedust.

The nitrogenous fertilizers—Sulphate of Ammonia and Nitrate of Soda—if sown during extreme drought conditions, would remain practically intact until the first rain, after which they would function providing the rainfall did not become a deluge, and so cause the loss of nitrogen in the soluble form in flood and/or drainage waters.

Bone Phosphate and Potash Salts would suffer no loss of economic importance and even after heavy rain would be available in their original condition.

During the past season there were many queries as to the actual loss in fertilizer in cases of seed failing to germinate or crops resulting in complete failure. The preceding remarks answer most of the questions. With sowings of fertilizer and seed through the drill—the almost general method now-a-days—it naturally follows that in any resowing it is impossible to pick up the rows accurately enough to place the seed in contact with the fertilizer, thus the full residual benefit is not obtained in the subsequent sowing.

With broadcast sowing (which should be practised with organic fertilizer) or the top dressing of pasture with Superphosphate the fertilizers remain intact until rain falls when they function as under normal conditions. That during the year 1938 the tendency of the man on the land was to favour the complete fertilizer is evident both from the nature of the many inquiries received and the demand for this type of fertilizer throughout the country. The increasing use of the mixed and complete fertilizer is interesting and may be due to a consensus of opinion among agriculturists as a result of many years of practical observation, either in the one district or after farming many different soil types.

In the early days of the present century a topic of conversation among farmers was the new-fangled idea of sowing crops with the "limey" looking Superphosphate. In those times it was rare to find any one using the

A bone dust mill situated in a country district.

Abattoirs provide the raw material used in the manufacture of blood and bone fertilizer.

fertilizer; to-day it is in use on practically every farm in the State, and the local output has increased over twenty times since 1900.

Recent experiments both in Australia and overseas have discovered virtues in certain lesser or "trace" elements including Boron, Manganese, Copper, Magnesia, and Cobalt, and it is quite within the realms of possibility that the artificial fertilizer of the future will combine not only the common plant foods with trace elements, but will have pesticidal properties as well.

During 1938 twenty-seven samples of various artificial fertilizers were withdrawn from parcels in the metropolitan and country areas. These comprised Superphosphate (5), Blood and Bone (5), Super. and Ammonia (4), Bone and Super. (3), Super. and Bone (2), Market Garden Manure (2) and one sample each of the following fertilizers: Blood Bone and Super., Phosphate and Ammonia, Ammonium Sulphate, Potash Sulphate, Nitro Super., Bonedust and a Complete Fertilizer.

With the object of covering as large a field as possible the policy is to take samples from the many different consignments which come under observation, at the same time avoiding unnecessary duplication. Special visits are paid to factories in town and country for the purpose of ascertaining whether manufacturers and vendors are complying with the principal clauses of the Act.

The important part of the inspections, of course, is the result of the analyses of the samples collected. The position in Victoria is such that the inspection of consignments of Superphosphate and other simple fertilizers becomes merely a matter of routine, and as the

TABLE I.—VALUE OF FERTILIZERS AS CALCULATED.

Description of Fertilizer.	Average Value Guaranteed per ton.			Average Value Received per ton.			Excess Value per ton.		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Superphosphate ..	3	15	0	3	16	3	0	1	3
Blood and bone ..	8	3	9	8	12	4	0	8	7
Super. and ammonia (mixed grades) ..	6	6	1	6	9	4	0	3	3
Bone and Super. ..	5	10	6	5	19	3	0	8	9
Super. and bone ..	5	2	8	4	15	1	0	7	7
Market garden manure	6	9	0	6	7	6	0	1	6
Nitro-super.	5	10	1	5	0	0	0	10	1
Blood, bone and super.	6	7	3	5	12	10	0	14	5
Phosphate and ammonia	4	15	0	4	18	0	0	3	0
Bonedust	6	9	10	7	15	11	1	6	1
Complete fertilizer ..	6	0	5	6	8	10	0	8	5
Potassium sulphate ..	15	7	6	15	10	11	0	3	5
Ammonium sulphate ..	12	7	3	12	9	10	0	2	7

sales of these fertilizers constitute well over 90 per cent. of the total tonnage retailed annually in the State the position is regarded as highly satisfactory.

A review of the analyses of samples collected during the year compared with the quality guaranteed, the figures for which appear in the table appended, will prove of interest. For the purpose of further comparison the analytical figures of the samples collected have been averaged, and the average quality as guaranteed and found has been converted into monetary value by the unit value system. The values so calculated appear in Table I.

It will be remarked that the quality of every fertilizer which was sampled exceeded the quality guaranteed on the labels attached to each bag sampled, the excess value per ton ranging from 1s. 3d. per ton with Superphosphate up to £1 6s. 1d. in the case of the single sample of Bonedust, which must be regarded as the star bargain for the year. It is often observed that proprietors of country bone-mills are not quite just to themselves; this inexactness is perhaps to some extent due to a lack of technical control.

As will be observed, the figures in the table favour the former in every instance, which, together with the fact that no prosecution under the Act occurred during the year, once again proves the high quality of the fertilizers sold in Victoria.

RESULTS OF ANALYSIS OF SAMPLES OF ARTIFICIAL FERTILIZERS COLLECTED IN VICTORIA DURING THE 1938 SEASON UNDER THE PROVISIONS OF THE FERTILIZERS ACT 1928, No. 3680.

Bottle Label No.	District in which Sample was Obtained.	Brand and Description of Fertilizer.	Analysis as Guaranteed by Manufacturer or Found by Chemist.	Nitrogen.			Phosphoric Acid.				Potash as Sulphate.	Manufacturer or Importer.
				As Ammonia.	As Blood and Bone.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		
				%	%	%	%	%	%	%	%	
1913	Gippsland..	Cresco Bone and Super.	Guaranteed	..	2·00	2·00	9·50	3·90	3·00	16·40	..	Cresco Fertilizers Ltd., Geelong
			Found ..	..	2·48	2·48	7·70	4·35	5·16	17·21	..	
1926	„ ..	Cresco Market Garden Manure	Guaranteed	1·50	1·56	3·06	11·65	1·49	3·26	16·40	2·42	„ „ „
			Found ..	1·73	1·75	3·48	11·69	1·19	3·74	16·62	2·43	
1927	„ ..	Sickle in diamond Phosphate and Ammonia	Guaranteed	2·00	..	2·00	8·20	0·20	18·90	27·30	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
			Found ..	2·19	..	2·19	7·80	0·46	19·52	27·78	..	
1928	„ ..	Sickle in diamond Super. and Ammonia 1 : 1	Guaranteed	10·30	..	10·30	10·25	0·25	0·50	11·00	..	„ „ „
			Found ..	11·09	..	11·09	9·39	0·23	0·45	10·07	..	
1929	„ ..	Sickle in diamond Bone and Superphosphate No. 1	Guaranteed	..	2·00	2·00	11·40	3·00	5·30	19·70	..	„ „ „
			Found ..	..	2·58	2·58	10·84	2·12	7·02	19·98	..	
1931	„ ..	Sickle in diamond Nitro-Super.	Guaranteed	1·50	0·50	2·00	16·70	1·10	2·00	19·80	..	„ „ „
			Found ..	1·77	0·53	2·30	17·73	0·82	3·01	21·56	..	
1932	„ ..	P.M. Blood and Bone Fertilizer	Guaranteed	..	7·00	7·00	..	6·31	5·69	12·00	..	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
			Found ..	..	7·26	7·26	..	5·68	6·42	12·10	..	
1933	„ ..	Dundas Blood and Bone	Guaranteed	..	4·50	4·50	..	7·14	13·61	20·75	..	J. A. Dundas, Dynon-road, Footscray
			Found ..	..	5·24	5·24	..	6·31	12·33	18·64	..	
1934	„ ..	Sickle in diamond Complete Manure No. 2	Guaranteed	1·00	1·00	2·00	14·80	0·40	0·70	15·90	4·80	Commonwealth Fertilizers and Chemicals, Ltd., 65 William-street, Melbourne
			Found ..	1·25	1·12	2·37	14·74	0·43	1·56	16·73	4·85	
1935	Metropolitan	Sickle in diamond Superphosphate and Bone No. 2	Guaranteed	..	1·00	1·00	17·00	1·40	1·90	20·30	..	„ „ „
			Found ..	..	1·14	1·14	16·04	2·60	3·30	21·94	..	
1936	„	Sickle in diamond Market Garden Manure	Guaranteed	1·70	1·50	3·20	11·50	2·50	3·10	17·10	2·42	„ „ „
			Found ..	1·72	1·80	3·52	11·67	1·74	4·81	18·22	2·53	
1937	„	Sickle in diamond Blood, Bone, and Superphosphate	Guaranteed	..	2·50	2·50	12·50	1·43	2·96	16·90	..	„ „ „
			Found ..	..	2·50	2·50	15·28	3·16	2·02	20·46	..	
1938	„	Imperial in diamond Blood and Bone	Guaranteed	..	4·50	4·50	..	6·00	12·00	18·00	..	W. Anglis and Co. (Aust.) Pty. Ltd., Bourke-street, Melbourne
			Found ..	..	4·24	4·24	..	5·59	15·13	20·72	..	
1939	„	Sickle in diamond Sulphate of Ammonia	Guaranteed	20·60	..	20·60	..	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
			Found ..	20·82	..	20·82	..	..	..	..	..	

RESULTS OF ANALYSIS OF SAMPLES OF ARTIFICIAL FERTILIZERS COLLECTED IN VICTORIA DURING THE 1937 SEASON UNDER THE PROVISIONS OF THE FERTILIZERS ACT 1928, No. 3680—*continued.*

Bottle Label No.	District in which Sample was Obtained.	Brand and Description of Fertilizer.	Analysis as Guaranteed by Manufacturer or Found by Chemist.	Nitrogen.			Phosphoric Acid.				Potash as Sulphate.	Manufacturer or Importer.
				As Ammonia.	As Blood and Bone.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		
				%	%	%	%	%	%	%	%	
1940	Croydon ..	Sickle in diamond Superphosphate and Ammonia 3 : 1	Guaranteed	5·00	..	5·00	15·40	0·30	0·80	16·50	..	" " "
			Found ..	5·16	..	5·16	15·65	0·39	0·92	16·96	..	
1941	"	Sickle in diamond Superphosphate and Ammonia 6 : 1	Guaranteed	2·90	..	2·90	17·50	0·40	0·90	18·80	..	" " "
			Found ..	3·04	..	3·04	17·25	0·58	0·92	18·75	..	
1942	Gippsland..	Sickle in diamond Blood and Bone	Guaranteed	..	5·00	5·00	..	5·00	9·00	14·00	..	" " "
			Found ..	..	5·04	5·04	..	4·63	13·10	17·73	..	
1943	Croydon ..	Sickle in diamond Bone and Superphosphate No. 1	Guaranteed	..	2·00	2·00	11·40	3·00	5·30	19·70	..	" " "
			Found ..	..	2·05	2·05	11·68	2·15	6·48	20·31	..	
1944	Geelong ..	Corio Blood and Bone	Guaranteed	..	4·00	4·00	..	6·00	8·00	14·00	..	The Corio Trading Co. Pty. Ltd., Moorabool - street, Geelong
			Found ..	..	3·94	3·94	..	5·47	13·11	18·58	..	
1945	" ..	Pivot Superphosphate 22 per cent.	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-street, Melbourne
			Found ..	..	..	..	20·60	0·52	1·72	22·84	..	
1946	" ..	Cresco Superphosphate 22 per cent.	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Cresco Fertilizers Ltd., Geelong
			Found ..	..	..	..	19·44	0·49	1·63	21·56	..	
1947	" ..	Cresco Superphosphate and Ammonia 3 : 1	Guaranteed	5·00	..	5·00	15·37	1·13	..	16·50	..	" " "
			Found ..	4·63	..	4·63	16·31	1·20	0·12	17·63	..	
1948	" ..	*Corio Bonedust..	Guaranteed	..	..	2·50 (as bone)	..	..	..	20·00	..	The Corio Trading Co. Pty. Ltd., Moorabool - street, Geelong
			Found ..	..	..	2·05	..	..	..	28·66	..	
1949	" ..	Cresco Superphosphate 22 per cent.	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Cresco Fertilizers Ltd., Geelong
			Found ..	..	..	..	20·33	0·50	1·37	22·20	..	
1950	Ballarat ..	Cresco Superphosphate 22 per cent.	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	" " "
			Found ..	..	..	..	20·20	0·51	1·53	22·24	..	
1951	" ..	Cresco Superphosphate and Bone	Guaranteed	..	1·00	1·00	16·10	1·10	3·60	20·80	..	" " "
			Found ..	..	0·95	0·95	17·81	0·86	4·08	22·75	..	
1952	" ..	Cresco Sulphate of Potash	Guaranteed	..	..	..	..	..	..	..	48·50	" " "
			Found ..	..	..	..	..	..	..	..	49·10	
1953	" ..	Sickle in diamond Superphosphate 22 per cent.	Guaranteed	..	..	..	20·50	0·50	1·00	22·00	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
			Found ..	..	..	..	20·14	0·52	2·31	22·97	..	

* Found to contain 54 per cent. fine material against a guarantee of 51·5 per cent.

Butter-fat Losses in Churning *continued from page 397.*

Conclusions.

The efficiency of churning, as judged by the proportion of fat churned which is lost in the butter-milk, should be regularly determined by the buttermaker. In any attempt to reduce the losses the following points should be kept in mind:—

(*a*) The cream should contain between 35 and 40 per cent. of fat.

(*b*) Neutralization should be carefully done, preferably with a soda neutralizer.

(*c*) The cream should be chilled to a sufficiently low temperature and held at least three hours, preferably overnight. The temperature to which the cream should be chilled will vary according to the type of cream being received and should be modified throughout the season to suit this.

(*d*) The cream should be churned at a suitable temperature which will also vary with the cream and the season.

(*e*) The churn should be filled to the correct capacity.

(*f*) Unnecessary agitation of the hot cream should be avoided in the factory.

(*g*) The quality of the butter must not be lost sight of when any modifications designed to reduce fat losses are introduced.

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip. Ed., Principal, School of Horticulture, Burnley.

Garden Notes.

THE worst of the winter has now passed, and the days are beginning to have a touch of Spring in them. Already the early-flowering fruit trees and bulbs are well in bloom, and the gardens are awakening from their slumbering period. The soil around transplanted seedlings needs careful stirring to allow the warmer air to enter and assist in raising the temperature of the soil.

The herbaceous perennial plants should be divided and replanted. Put in the first batch of gladioli corms this month. Sow seeds of any of the following: Aster, Antirrhinum, Carnation, Delphinium, Dianthus, Geum, Lupins, Verbena, Scabious and Wallflower. This is a good month for planting out Delphinium crowns, Carnations, Aquilegia, Antirrhinum, Stocks and Pansies. August is the best time for planting out evergreen shrubs which are not frost-tender in the early stages. When making a selection be sure to include a few Australian ones. Australian shrubs are usually relegated to the poorest part of the garden, because of the erroneous belief that they do not like a good soil. As a matter of fact, they readily respond to good soil conditions in the same way as do other plants, and when well treated, the result is in many cases very beautiful. Included in these are: The Myrtle group; there are several shrub-like plants in this family, such as:

(1) Thryptomene, or Grampians Myrtle. This is a very handsome little shrub which is easily grown. It produces a mass of small pink and white starry flowers and blooms for a long period.

(2) Eugenia, the native Myrtle. These are large shrubs or small trees. *Eugenia smithii* grows to a height of about 30 feet and produces small white flowers followed by white to purple berries about the size of a small cherry.

Eugenia paniculata—the rose apple is not such a vigorous grower; it bears rose-coloured berries which are oval shaped.

The Legume group: These consist of plants producing pea-shaped flowers, and the undermentioned will grow under ordinary garden conditions:

(1) Swainsona—the Darling Pea. These are very hardy herbaceous plants which produce white to red flowers during most of the year. They grow about three feet in height.

(2) Hardenbergia—the Sarsaparilla, is a climber that does well in protected places. The best variety is *Hardenbergia comptoniana,* which has bluish-purple flowers and comes from Western Australia.

(3) Kennedya—the Coral Pea. This is a strong climber and very hardy. It produces clusters of red pea-shaped flowers and is very useful for covering sheds and fences.

In addition to the foregoing, there are many others worthy of a place in the garden, such as the Acacias, Grevilleas, Bottle Brushes, Tea Trees, and Eucalypts.

Vegetables.

The advent of warmer weather conditions is the signal to commence sowing seeds for summer vegetables, and to give the perennial ones a little attention.

The asparagus bed should have a good dressing of sulphate of ammonia at the rate of 2 oz. per square yard. This should be scattered all over the area, and not just around the plants, thus encouraging and developing an extensive root system. The rhubarb bed will require much the same attention.

If small fruits are grown, give them a clean up and then lightly fork in a dressing of market garden manure (about 3 oz. per square yard). Make sowings of any of the following: peas, beetroot, carrots, radish, lettuce and parsley.

If a glass frame is available, make an early planting of tomatoes and cucumber so that they will be ready to plant out about October. Commence to get the bed ready for them now by digging into it a liberal supply of farmyard manure.

It is advisable to sow the early sowings of lettuce in a seed-bed and transplant them as required. They grow slowly this time of the year, so that two or three transplantings may be made from the one sowing. Transplant the early plants into a well-drained light soil in a warm position, but later in the season a position sheltered by climbing beans or such like is better. The heart or cabbage type is the more popular, and of these New York, Drumhead, Webb's Wonderful and Iceberg are good growers and produce large hearts which are very crisp. Iceberg has leaves with pinkish-brown tips and this causes a prejudice against it. The Cos type of lettuce has no heart but consists of long tender leaves. White Cos and Eclipse are good varieties of this type.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor.

EARLY-FLOWERING varieties of peach, nectarine, apricot, and plum treees will commence blooming this month, and the majority of almond varieties will be in full bloom. Early dessert peaches, such as Le Vainqueur, Sneed, and Mayflower are usually in bloom in the Doncaster district about the fourth week in August. Santa Rosa, the Japanese plum, will be in full bloom in the metropolitan district during the third or fourth week in August. The following varieties of almonds blossom about the last week of July and the first week of August:—I.X.L., Peerless, Large Papershell, Early Jordan, Brande's Jordan, Chellaston, and Ne Plus Ultra. These are followed by White Nonpareil, Golden State, Hatch's Nonpareil, and Burbank. For commercial almond production, it is essential to provide adequate cross-pollination, and when such varieties are being grown, cross-pollination can be assured by planting one or more of the above-named varieties whose names appear either just before or just after the name of the variety to be pollinated. For example, the early blossoms of Ne Plus Ultra will pollinate mid-season and late blossoms of Brande's Jordan and act as very good pollinators for Chellaston, Early Jordan, Golden State, and White Nonpareil. In choosing a variety to act as a pollinator, its commercial value should not be overlooked.

Most of the Japanese and European plums require cross-pollination. In some seasons the full-bloom period of the Japanese plums occurs at the end of August, or, occasionally, during

the first week in September. Burbank, Satsuma, Wickson, and Santa Rosa frequently blossom about the same period. Most of the European varieties blossom during September, commencing with the common cherry plum. Notes on the pollination of the European varieties will, therefore, be dealt with in next month's orchard notes.

Early-blossoming varieties of pears and cherries, although they may show bud movement during August, do not blossom until September. This bud-movement stage in the tree's annual life cycle is important because it indicates to the grower the time for application of sprays for the purpose of preventing a number of fungous diseases. Once bud movement commences on peach trees it is too late to apply tar distillate sprays for the control of Green Peach Aphis, because this material causes injury as soon as the tree has shown early signs of growth. Growers who fail to apply this ovicide will have to rely on repeated applications of nicotine sulphate and soft soap to prevent damage by the pest. It has already been pointed out in the daily press and wireless broadcasts that there is a danger of a severe epidemic of Green Peach Aphis during the approaching spring, and growers are urged to adopt early control measures to keep it in bounds. While on the subject of bud movement, apricot and peach growers will realize the importance of the 6:4:40 Bordeaux Mixture spray application at the "pink bud" stage of apricot and peach trees. This spray is essential in the prevention of Brown Rot and Curly Leaf of the peach and will also assist in preventing Shot Hole and Scab and Freckle of the apricot.

Early peaches like Hale's and Brigg's Red may shed their blossom buds. These varieties are frequently pruned when the trees are in bloom.

Ploughing should be completed before sprays are applied, but with early-blooming varieties of fruit this is sometimes impossible because of the state of the soil. If ploughing cannot be carried out before spraying, it should be postponed until the danger of fungous infection of the early leaves has passed. The stirring of the soil during periods favorable to fungous infection is not a sound orchard practice. In subsequent cultivation, attention should be directed to the soil around the base of apricot, peach, and cherry trees, which should be thoroughly cultivated to destroy the over-wintering stage of the Brown Rot fungus.

Applications of fertilizer to the early-blooming varieties should be made early this month; later-blooming varieties may be fertilized in early September. Early application will ensure that the plant food applied to the soil will have an opportunity of reaching the feeding-root zone by the time the tree requires it.

Cherry, peach, plum, and apricot trees can be grafted during August, the usual method is the "bark" or "crown" system. Grafting is practised for two purposes—either to change the variety of the tree or, in the case of cherries and plums, to provide another variety for cross-pollination purposes. Any growers desiring information on the grafting of trees should apply to this Department for the free bulletin entitled "Re-working, Budding, and Grafting of Deciduous Fruit Trees," which contains full details of the methods.

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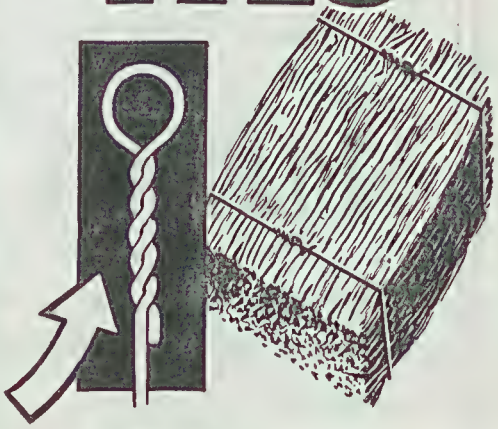

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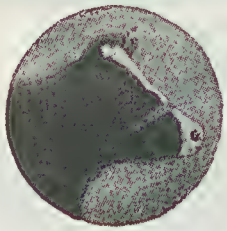

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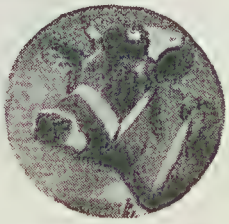

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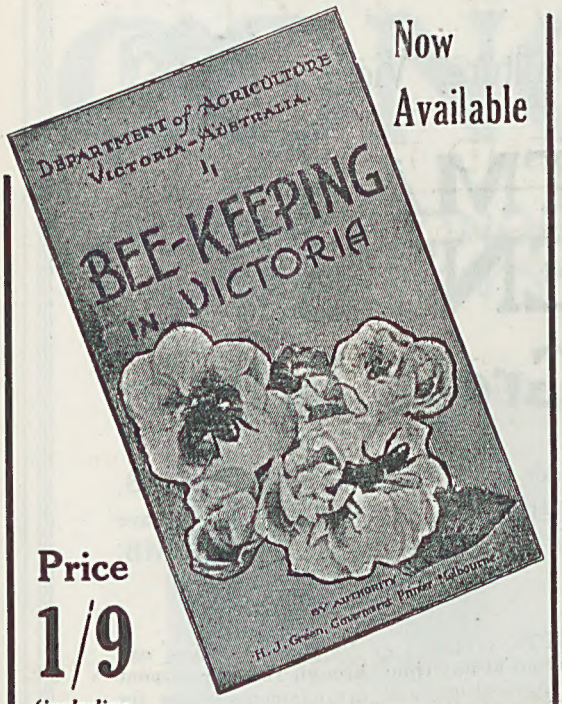

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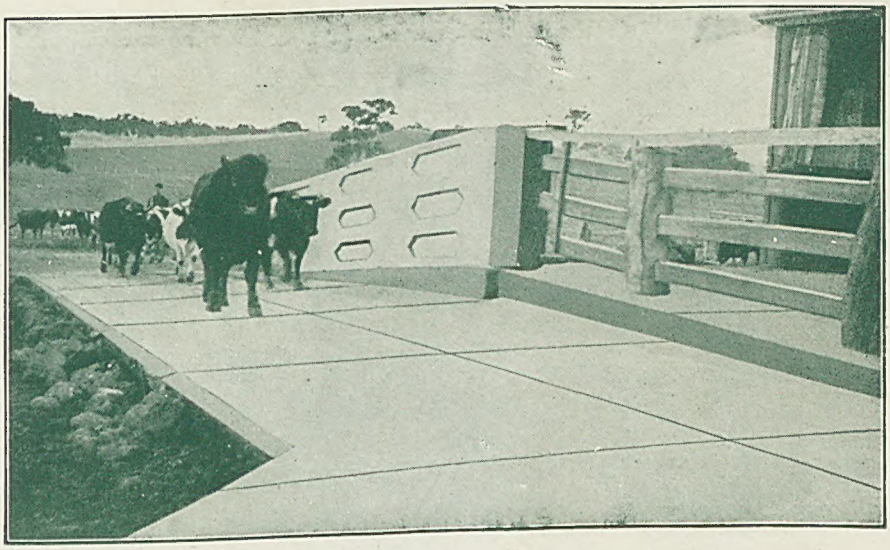

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